Calendar No. 198

99TH CONGRESS *1st Session*	SENATE	REPORT 99-91

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT OF 1986

Mr. DANFORTH, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

together with

ADDITIONAL VIEWS

OF THE

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ON

H.R. 1714

JUNE 24 (Legislative Day JUNE 3), 1985.—Ordered to be printed

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ACRONYM DEFINITIONS

ACTS	Advanced Communications Technology Satellite
AMPTE	Active Magnetospheric Particle Tracer Explorers
ATAC	Advanced Technology Advisory Committee
ATB	Advanced Technology Blades
ATP	Advanced Turboprop
ATS	Applications Technology Satellite
COBE	Cosmic Background Explorer
CRIE	Cosmic Ray Isotype Experiment
DOD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
DSN	Deep Space Network
ESA	European Space Agency
EUVE	Extreme Ultraviolet Explorer
GRO	Gamma Ray Observatory
IOC	Initial Operating Capability
ISTP	International Solar-Terrestrail Physics
IUS	Intertial Upper Stage
JSC	Johnson Space Center
JVX	Joint Services Advanced Vertical Lift
LAP	Large-scale Advanced Propeller
MLP	Mobile Launch Platform
MO&DA	Mission Operations and Data Analysis
MPS	Materials Processing in Space
MSFC	Marshall Space Flight Center
MSL	Materials Science Laboratory
NAS	Numerical Aerodynamic Simulation
NASA	National Aeronautics and Space Administration
N-ROSS	Navy Remote Ocean Sensing Satellite
NSTL	National Space Technology Laboratory
OMV	Orbital Maneuvering Vehicle
OPF	Orbiter Processing Facility
OTV	Orbital Transfer Vehicle
PAM	Payload Assist Module
PTA	Propeller Test Assessment
ROSAT	German Roentgen Satellite
RSRA	Rotor Systems Research Aircraft
SL	Space Lab
SL–2	Space Lab—2
SL–3	Space Lab—3
SLS–1	Space Life Sciences
SME	Solar Mesophere Explorer
SMM	Solar Maximum Mission
SRMC	Southern Regional Medical Consortium
SOT	Solar Optical Telescope
SPC	Shuttle Processing Contract
SRB	Solid Rocket Booster
SSEC	Solar System Exploration Committee
STDN	Space Tracking and Data Network
STS	Space Transportation System
TDRSS	Tracking and Data Relay Satellite System
TFSUSS	Task Force on Scientific Uses of the Space Station
TOPEX	Ocean Topography Experiment
TOS	Transfer Orbital Stage
TSS	Time Sharing System
UARS	Upper Atmosphere Research Satellite
VRM	Venus Radar Mapper
WSTF	White Sands Test Facility

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT OF 1986

JUNE 24 (legislative day, JUNE 3), 1985.—Ordered to be printed

Mr. DANFORTH, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

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ADDITIONAL VIEWS

[To accompany H.R. 1714]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (H.R. 1714) to authorize appropriations to the National Aeronautics and Space Administration for research and development, space flight, control and data communications, construction of facilities, and research and program management, and for other purposes, having considered the same, reports favorably thereon with an amendment in the nature of a substitute and recommends that the bill do pass.

PURPOSE OF THE BILL

The purpose of this bill is to authorize appropriations to the National Aeronautics and Space Administration (NASA) totaling $7,652 million for fiscal year 1986 as follows:

	Budget request	Committee authorization
Fiscal year 1986:		
Research and development	$2,881,800,000	$2,755,800,000
Space flight, control, and data communications	3,509,900,000	3,386,900,000
Construction of facilities	149,300,000	139,300,000
Research and program management	1,345,000,000	1,370,000,000

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COMMITTEE ADJUSTMENTS TO NASA REQUEST FOR FISCAL YEAR 1986—SUMMARY

Fiscal year 1986	Administration request	Committee authorization
Research and Development:		
Space transportation capability development	$459,300,000	$477,200,000
Space station	230,000,000	200,000,000
Physics and Astronomy	630,400,000	608,400,000
Life Sciences	72,000,000	68,000,000
Planetary Exploration	359,000,000	349,000,000
Space Applications	551,800,000	508,000,000
Technology Utilization	11,100,000	9,500,000
Commercial Use of Space	30,000,000	16,500,000
Aeronautical Research and Technology	354,000,000	350,400,000
Space Research and Technology	168,000,000	154,000,000
Space tracking and Data systems	16,200,000	14,800,000
Total	2,881,800,000	2,755,800,000
Space Flight, Control, and Data Communications:		
Space Shuttle Production, and Operational Capability	976,500,000	941,500,000
Space Transportation Operations	1,725,100,000	1,700,100,000
Space Tracking and Data Acquisition	808,300,000	745,300,000
Total	3,509,900,000	3,386,900,000
Construction of facilities	149,300,000	139,300,000
Research and Program Management	1,345,000,000	1,370,000
Grand Total	7,886,000,000	7,652,000,000

Legislative History

On February 1, 1984, the fiscal year 1986 budget request for the NASA was submitted to Congress. The Committee considered the budget request in hearings on February 26, March 27 and 28, and April 3 and 4. Testimony was received from the NASA Administrator and from representatives of the Department of Defense (DOD), the aerospace industry, the space science and application communities, and other outside witnesses. On June 12, 1984, Senator Gorton, along with Senators Danforth, Hollings, Riegle, Long, Inouye, Exon, Ford, Gore, Rockefeller, Denton, Heflin, Lautenberg, Glenn, and Matsunaga, introduced the National Aeronautics and Space Administration Authorization Act of 1986, S. 1278, which was referred to the Committee on Commerce, Science, and Transportation.

On June 13, 1984, the Committee considered S. 1278. Because the House NASA authorization bill (H.R. 1714) had already been referred to the Committee, the Committee offered S. 1278 as an amendment in the nature of a substitute to H.R. 1714. The Committee then ordered H.R. 1714 to be reported, without objection.

Summary of Major Provisions

For fiscal year 1986, the Committee's NASA authorization bill authorizes $7,652,000,000, of which $2,755,800,000 is for research and development; $3,386,900,000 is for space flight, control, and data communications; $139,300,000 is for construction of facilities; and $1,370,000,000 is for research and program management.

The Space Transportation Capability Development budget of $477,200,000 is $17,900,000 greater than the fiscal year 1986 NASA budget request of $459,300,000 and provides for continued development of Spacelab hardware. Also included in the fiscal year 1986 funding are development and operational activities for upper stages and for continued design and development of the hardware for the United States/Italian Tethered Satellite System. Space Transportation Systems funding in fiscal year 1986 also provides for the new start of the Orbital Maneuvering Vehicle (OMV) an integral transportation element in the Space Shuttle and space station programs.

The Committee has provided $200,000,000 for the continuation of extended definition and design studies for the permanently manned space station. The Committee's space station recommendation is $30 million below the administration's request of $230,000,000.

The budget for the Space Sciences programs for fiscal year 1986 is $1,025,400,000, compared to the administration's request of $1,061,400,000. The Committee's Space Science recommendation retains the administration's budget request for research and analysis in Physics and Astronomy and in Planetary Exploration, and supports the ongoing activities of the Hubble Space Telescope program and the planetary missions to Venus (Venus Radar Mapper), Jupiter (Galileo) and the Sun (Ulysses).

The Space Applications funding for fiscal year 1986 is $508 million, compared to the administration's budget request of $551,800,000. Space Applications funding retains the administration's request for Materials Processing in Space and authorizes $80 million for the Advanced Communications Technology Satellite (ACTS) program and $114 million for the Upper Atmosphere Research Satellite program.

The Committee has authorized $16,500,000 for Commercial Use of Space, compared to the administration's request of $30 million and to a fiscal year 1985 appropriation of $8,500,000.

The Committee's authorization provides $350,400,000 for Aeronautical Research and Technology, compared to the administration's request of $354,400,000 and to the fiscal year 1985 appropriation of $342,400,000.

Space Research and Technology is funded at a level of $154,000,000, compared to the administration's request of $168,000,000.

The authorization for Tracking and Data Acquisition Advanced Systems is maintained at the fiscal year 1985 appropriation level of $14,800,000.

The total Research and Development budget for the above-mentioned programs for fiscal year 1986 is $2,755,800,000, compared to a fiscal year 1986 budget request of $2,881,800,000 and a fiscal year 1985 funding level of $2,422,600,000.

Within the Space Flight, Control, and Data Communications budget of $3,386,900,000, the Space Shuttle Production and Operational Capability is funded at a level of $941,500,000. This funding level enables NASA to continue production of Space Shutte structural spares and main engines.

Shuttle Operations activities within Space Flight, Control, and Data Communications are funded at a level of $1,700,100,000. This

funding provides for the procurement of the external tanks, the solid rocket motors and boosters hardware; flight operations; and launch and landing activities.

Finally, within Space Flight, Control, and Data Communications, $745,300,000 is made available for space and ground networks, communications, and data systems, most of which supports the Tracking and Data Relay Satellite System (TDRSS).

The Committee recommendation for construction of facilities for fiscal year 1986 is $139,300,000, which is $10 million less than the administration's budget request. The Committee recommendation for Research and Program Management is $1,370 million, compared to the administration's budget request of $1,345,000,000.

S. 1278, and H.R. 1714 (as reported by the Committee), includes language prohibiting the use of the space station to carry or deploy nuclear weapons or any other weapons of mass destruction.

Also, this bill directs the President or the NASA Administrator to report to the Senate and House authorization committees on Space Shuttle pricing policy for fiscal years 1989–91. Furthermore, before this policy can be implemented, these two committees must have had 30 days to review this policy and, where appropriate and necessary, recommend legislation establishing a Shuttle pricing policy for fiscal years 1989–91.

This legislation defers NASA's fiscal year 1986 principal payment of $107 million to the Federal Financing Bank. This payment is currently scheduled pursuant to a loan agreement which finances the TDRSS.

This bill also authorizes $586,000 for the Office of Commercial Space Transportation of the Department of Transportation (DOT) for fiscal year 1986 and extends the life of the National Commission on Space from twelve months to eighteen months.

Research and Development—$2,755,800,000

Space Station—$200,000,000

The Committee has authorized $200 million for fiscal year 1986 for the space station program, $30 million below the administration's request.

The U.S. space station will provide a permanently manned facility in space, which will enhance the Nation's science and applications programs, which will allow further commercial use of space, and will stimulate advanced technologies. A vigorous but deliberately paced Space Station program will permit us to maintain the preeminence in space our Nation has attained through various manned and unmanned programs.

The space station will be a multipurpore facility providing a permanent human presence in space to conduct essential scientific and technical research, to perform unique commercial activities, and to perform more efficiently operational tasks in space, such as satellite servicing. The use of the space station will involve extensive national and international user community participation. The program definition phase will feature continuing emphasis on and iteration of user requirements. The space station will incorporate a modular design philosophy which will permit the system to evolve through time, as warranted, to provide greater user utility and

operational capabilities. Its manned and unmanned elements will be designed to facilitate maximum on-orbit maintainability/restorability, operational autonomy, and simplified user interfaces. Implicit in these objectives is the recognized need to optimize the synergistic effects of the man/machine combination in space via automation, robotics, and artificial intelligence technology. The space station will provide essential system elements and operational considerations for an integrated national space capability. The space station facility (core and associated platforms) will be placed and maintained in low-Earth orbit by the STS, thereby building upon the previous national investment in space.

A basic premise of the space station program is to perform a thoroughly detailed front-end definition including: engineering design by industrial contractors; subsystem advanced development and tests in dedicated test beds; early flight experiments on the Space Shuttle to prove system feasibility; and continued trade studies for system optimization. It will also include a thorough analysis of a "man-tended" space station option. Detailed definition, thoroughly digested and incorporated into hardware specifications, provides the greatest single assurance of program success and the achievement of cost and schedule targets. Throughout the definition period, NASA will work to identify better growth potential and evolutionary configurations to insure that the space station is able to grow. Following an extensive definition program, consisting of both in-house and contracted activities, NASA will begin development in fiscal year 1987 with a goal of 1993 for an initial operational space station.

Committee Comments

The Committee continues to believe that the administration's proposal to develop a permanently manned space station is an initiative that could dramatically enhance our exploratory and operational capabilities in space, as well as yield unforeseen and significant benefits with terrestrial applications. The Committee notes with approval that the Phase B systems definition and design contracts have begun and that the international memoranda of understanding have been signed.

The Committee is pleased that the space science community has increased its support for and participation in the space station program and further believes that this growing involvement is due to NASA's increased willingness to incorporate the goals and objectives of the space science community in the planning of the space station. In his testimony before the Committee, Dr. Peter Banks, the Chairman of NASA's Task Force on Scientific Uses of the Space Station (TFSUSS), stated that the national space research community has dramatically changed its opinion about the space station program and that the Task Force has been gratified with NASA's reception to concepts and advice generated by the Task Force.

Although there are still issues to be resolved relative to the conduct of space science aboard the space station, the Committee notes with approval that NASA has made a good faith effort to understand the concerns of the space science community and to address

these concerns, where practical. Key issues, however, such as the nature of any coorbiting platform(s) and how NASA will be able to develop new experiments for the space station, without distorting the ongoing programs of space science research unconnected with the space station, are still unresolved. So that the Committee may better understand the nature and productivity of the dialogue between the space science community and NASA, the Committee requests that NASA prepare a report, by December 31, 1985, which assesses the results of the TFSUSS-sponsored space station summer study held April 13–14, 1984. Furthermore, the Committee requests that NASA include in this report which of the recommendations of this summer study it intends to implement, how it intends to implement these recommendations, and the associated costs.

Over the past year, NASA has expressed a growing willingness to incorporate automation and robotics technologies in the space station initial operating capability (IOC). NASA's Advanced Technology Advisory Committee (ATAC) and the California Space Institute Automation and Robotics Panel have both made recommendations for advancing automation and robotics technologies in and through the space station program. The California Space Institute study recommends that NASA's advancement and demonstration of automation and robotics technologies increase to a funding range of $100 million to $190 million by 1990, a range of funding that the Committee believes will be difficult to accommodate given the present program funding profile. The Committee requests NASA to report by December 31, 1985, how and to what extent it intends to implement the recommendations of the ATAC and the California Space Institute and what would be the associated costs implementing these recommendations.

During the time that the Phase B memoranda of understanding have been negotiated and signed, the Committee has been increasingly aware of the complexities and sensitivities of the international element of his space station program. Even though the memoranda of understanding are essentially in place, there will continue to be ongoing discussions related to technology transfer, the protection of proprietary data rights, and the assignment of selected elements of the 1OC facility. In addition, international Phase B participants have already expressed concern about the nature of a Phase C/D commitment by the United States to the space station program. The Committee expects NASA to examine all possible agreements that could satisfy the goals and objectives of the participants and also expects to be kept informed on a regular basis about any developments in the area of international participation.

Consistent with its position 1 year ago, the Committee feels that the space station is a facility that should be used for peaceful purposes. Senator Gorton, therefore, included language in the fiscal year 1986 authorization bill which reaffirms this position. Section 7 of H.R. 1714, as reported by the Committee, restates Article IV of the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies. It is not the Committee's intent to preclude the DOD from conducting research and development activities on the space station, but it is the Committee's intent to ensure that

the space station is used for peaceful purposes, as it has been characterized since the program's inception.

The Committee recognizes that some delay in the program may be inevitable due to a reduction in the funding from the administration's original budget request. The Committee, however, urges NASA and the Phase B contract participants to make every attempt possible to complete the Phase B contracts as close as possible to the previously scheduled 21-month contract period so that Phase C/D development can begin as early as possible.

SPACE TRANSPORTATION CAPABILITY DEVELOPMENT—$477,200,000

The Committee has authorized $477,200,000 for fiscal year 1986, $17,900,000 more than the administration's request, and makes specific authorizations as follows:

Upper Stages	$174,400,000
Tethered Satellite System	14,000,000
Orbital Maneuvering Vehicle	10,000,000

The principle areas of activity in Space Transportation Capability Development are efforts related to the Spacelab, the upper stages that place satellites in high altitude orbits, the engineering and technical base support at NASA centers, payload operations and support equipment, advanced programs study and evaluation efforts, the development and first flight of the United States/Italy tethered satellite system, and the development of the Orbital Maneuvering Vehicle.

The Spacelab is a major element of the Space Transportation Systems (STS) program and provides a versatile, reusable laboratory which will be flown to and from Earth orbit in the Shuttle orbiter cargo bay. The development program which has been carried out jointly by NASA and the European Space Agency (ESA) continues with the second verification mission, Spacelab 2, scheduled for July, 1985. NASA's support of the Spacelab development effort includes ancillary flight and ground hardware and system integration activation efforts which assure Spacelab compatibility with the experiments and orbiter. The first operational mission, Spacelab 3, flew April 29–May 5 and was of the same general configuration as the first Spacelab mission.

The upper stages project includes the effort necessary to provide upper stages for use with the Space Shuttle to place payloads in orbits and trajectories beyond the capability of the Shuttle alone, primarily for planetary and geosynchronous missions. The program provides for procurement of stages for NASA missions, for technical monitoring and management activities for government and commercial upper stages, for a Solid Rocket Motor integrity program to establish an engineering data base for upper stage components, and for the NASA share of the joint Air Force development effort on the Centaur upper stages for use in the Shuttle.

The engineering and technical base provides the core capability for the engineering, scientific, and technical support required at the Johnson Space Center (JSC), the Kennedy Space Center (KSC), the Marshall Space Flight Center (MSFC), the White Sands Test Facility (WSTF), and the National Space Technology Laboratories (NSTL); for Space Transportation Systems research and develop-

ment activities. In fiscal year 1985 and subsequent years, computational capability is included to provide for complex flow dynamics modeling and other analyses in support of MSFC programs.

Payload operations and support equipment provides for developing and placing into operational status the ground and flight systems necessary to support the Space Transportation System payloads during prelaunch processing, on-orbit mission operations, and, when appropriate, post-landing processing. Included within this program area are the development and the initial operation of the Payload Operations Control Center, satellite servicing tools and techniques development, STS support services for NASA payloads flight demonstrations, and multimission payload support equipment.

The advanced programs effort identifies potenital future space programs and provides technical as well as programmatic data for their definition and evaluation. NASA plans space programs far in advance, to improve performance and reliability, and to reduce future risks and costs through the effective use of new technology.

The Tethered Satellite System, (TSS), initiated in 1984, will allow NASA to conduct space experiments in regions remote from the Shuttle orbiter. The objectives of the initial TSS mission, scheduled for 1988, are twofold: (1) To verify the controlled deployment, operation, and retrieval of the Tethered Satellite, and (2) to quantify the interaction between the satellite-tether and space plasma in the presence of a current drawn through the tether. The development of the Orbital Maneuvering Vehicle will allow NASA to deliver, retrieve, and service payloads more easily than it can with the current Space Transportation System.

Spacelab

The first Spacelab operational flight (SL–3) was launched in April 1985. The second verification flight (SL–2) is scheduled for July 1985. Activities before flight include physical integration, checkout of the Spacelab elements, and support of training, including the operations of the Spacelab simulator. After the flight, SL–2 will require deintegration of the Spacelab system components and postflight data analysis. Also, in fiscal year 1985, processing of the second flight of the Materials Science Laboratory (MSL) and preparation for the first Hitchhiker flights will take place. NASA will integrate the first life sciences mission (SLS–1) and astronomical observations mission (ASTRO–1), and will conduct analytical integration, configuration management, and software development for future flights.

Upper Stages

In upper stages, a joint development program with the DOD was initiated in fiscal year 1983 for the use of the Centaur as an STS upper stage. The common vehicle, designated Centaur, will accommodate a 40-foot long, approximately 10,000-pound payload in the bay of the orbiter, and is capable of placing it into geosynchronous orbit. It will be available in 1987. A longer version of the Centaur-G, known as G-Prime, is being developed by NASA for launch of the Galileo and Ulysses spacecraft in May 1986.

In February 1985, NASA disclosed certain cost overruns associated with the Centaur-G and Centaur-G Prime upper stages. According to NASA, the cost overruns are not related to any technical deficiencies and the two Centaur-G Prime upper stages are expected to be available for the May 1986, launches of the Ulysses and Galileo missions.

The total Centaur development cost overrun is approximately $60–$70 million. Of this amount, it is expected that the Air Force will absorb $20 million in fiscal year 1985. NASA intends to absorb approximately $25 million in fiscal year 1985 within certain contingency funds. The remaining $25 million in development cost overruns, however, will affect NASA's fiscal year 1986 requirements. In addition, another $30 million to $40 million will be required in fiscal year 1986 for growth in the support requirements of maintenance and engineering, for modifications to the orbiter, and for additional launch operations requirements.

The Inertial Upper Stage (IUS) was developed under a DOD contract to provide the capability to place payloads of up to 5,000 pounds into geosynchronous orbit. The first IUS was successfully launched in October 1982 on a Titan 34-D booster. The first IUS/STS launch in April 1983, carried the TDRS–1 spacecraft. The IUS failed to operate during the second stage boosts. The IUS anomalies were resolved by joint USAF/NASA action, and the DOD/NASA/Industry Anomaly Investigation Team determined that the IUS is ready for flight.

The first mission of this re-tested IUS occurred on January 24, 1985, abroad STS mission 51–C, the first DOD dedicated Shuttle mission. By placing a DOD satellite into geosynchronous orbit, the IUS met its mission objectives successfully.

NASA has bought four IUS vehicles for launch of the initial four TDRSS spacecraft; the first three were funded through the TDRSS contract while the fourth is funded under this budget element.

The objective of the Payload Assist Module (PAM) program is to provide low cost transportation, principally for commercial spacecraft, from the Shuttle's low Earth orbit to geosynchronous orbit. The Delta class PAM–D is capable of injecting up to 2,750–pound payloads into geosynchronous transfer orbit. The Atlas-Centaur class (PAM–A) is capable of inserting 4,400-pound payloads into the same orbit. PAM–DII is being developed commercially and will be capable of placing a 4,100-pound payload into geosynchronous transfer orbit and will be available for launch by mid 1985. Twenty-seven PAM–D's have been successfuly launched on the Delta, Atlas, and Space Shuttle. Nine of these launches have occurred since the two PAM–Ds failed on STS–11.

The Transfer Orbital Stage (TOS) is a three-axis stabilized perigee stage that is being commercially developed by the Orbital Science Corporation for use in the Shuttle. It will be able to place in the 6,000 to 13,000 pounds into geosynchronous transfer orbit and thus bridge the gap between PAM–DII and Centaur. The scheduled launch availability is late 1987.

The Solid Rocket Motor Integrity program began during fiscal year 1984 to establish an urgently needed engineering data base for use of composite materials in upper stage motor nozzles, to minimize risk to planned missions and to restore user confidence in

U.S. launch systems. NASA is examining physical and mechanical properties of selected components to developing and means of instrumenting manufacturing processes and their effect on material properties. It will conduct motor testing to verify analysis and create an engineering data base.

Engineering and technical base

The Engineering and Technical Base provides the core capability for the engineering, scientific, and technical support required at the JSC, the KSC, the MSFC, the WSTF, and the NSTL for research and development. In fiscal year 1985 and subsequent years, computational capability is included to provide for complex flow dynamics modeling and other analyses in support of MSFC programs.

Payload operations and support equipment

Payload operations funding is required to furnish payload services for NASA launches. Major payloads receiving support during this year include Galileo, Venus Radar Mapper, Ulysses, Tracking and Data Relay Satellite, Hubble Space Telescope, Spartan Halley, Astro-1, and Spacelabs-2 and -3. Further, efforts will continue to provide the means to maintain and repair satellites on-orbit by developing a series of tools, aids, and techniques, and to demonstrate capabilities and methods of improving the efficiency of on-orbit operations. The demonstrations will provide the experience necessary for realization of the Shuttle's potential for satellite servicing missions and on-orbit assembly functions.

Advanced programs

In fiscal year 1986, major emphasis will be placed on system concept definition and key advanced developments in crew systems, geostationary unmanned platforms, reusable Orbital Transfer Vehicles (OTV's), new capability mission kits for orbital maneuvering vehicles, future tethered systems applications, satellite servicing systems near and remote from the orbiter, and generic space systems capabilities. The overall goal continues to be the definition of the space elements needed for space operations over the next twenty years.

NASA will continue intensive study of unmanned launch vehicles in coordination with USAFO. Depending on present discussions, a major poriton of the fiscal year 1985 funds may go to a joint project office. Alternatively, NASA may issue study contracts with senior level NASA/DOD coordination.

Tethered Satellite System

The development of a TSS will provide a new facility for conducting space experiments at distances up to 100 kilometers from the Space Shuttle orbiter while being held in a fixed position relative to the orbiter.

The United States TSS hardware development of the deployment mechanism began in fiscal year 1984 following the completion of an advanced development phase initiated in fiscal year 1983. The United States is also responsible for overall program management and orbiter integration. The Italians completed the definition

phase in fiscal year 1983 and initiated the satellite hardware development in 1984. They are responsible for the satellite development and instrument and experiment integration. Some program delays are being encountered on the development of the Italian satellite and the presently planned 1988 launches are being reevaluated.

Orbital Maneuvering Vehicle

The Orbital Maneuvering Vehicle (OMV) will provide a new STS reusable extension capability for conducting orbital operations with spacecraft and payloads beyond the practical reach of the STS. The reusable OMV. operating as far as 800–1,400 nautical miles from the orbiter, will provide delivery, maneuvering, and retrieval of satellite payloads to and from altitudes or inclinations beyond the existing STS capability; reboost of satellites to original operational altitudes or higher; delivery of multiple payloads to different orbital altitudes and inclinations in a single flight; and safe deorbit of satellites which have completed their useful life.

The funding in fiscal year 1985 will allow NASA to begin to develop flight hardware for the OMV after completing in 1985 systems definition efforts begun with fiscal year 1984 Advanced Programs funding. Initiation of hardware development in fiscal year 1986 will lead to an initial operating capability in 1990 or 1991 at a total estimated cost of about $400 million. In fiscal year 1986, funding will allow NASA to design the OMV comprehensively, and confirm its requirements, and have a long lead time to pursued flight hardware and tooling.

Committee Comments

The Committee authorization of $477,200,000 includes specific authorizations of $174 million for upper stages; $14 million for the TSS, and $10 million for the OMV. Also, the Committee authorizes an additional $52 million above the Administration's request of $122 million for upper stages to accommodate the fiscal year 1986 cost overruns of the Centaur upper stage program. The Committee recognizes that the recently revealed problems associated with the Centaur program only exacerbate an already demanding schedule for the Centaur-supported planetary missions, Galileo and Ulysses, which are both scheduled for launch in May 1986. The Committee expects NASA To make every effort possible to conduct these two launches within the narrow "window" in May 1986, and expects to be kept informed about any other problems with this program.

Because of the budgetary pressures that exist in fiscal year 1986, the Committee has provided only $52 million of the projected $60 million cost overrun for the Centaur upper stage development and production program. This program is expected to absorb this difference.

The Committee authorizes a total of $14 million for fiscal year 1986 for the TSS, $7 million below the Administration's request. Because of delays in this program, particularly in the U.S. announcement of its science investigators, the originally scheduled launch date of December 1987 has now slipped to September 1988. The $7 million reduction is predicated on this delay.

Also, the Committee authorizes $10 million in fiscal year 1986 for the OMV, the only "new start" included in the budget request. Although the budget request for the OMV calls for $25 million in fiscal year 1986, the $15 million reduction is required largely due to budgetary pressures. This reduction does not reflect any Committee opposition to this initiative. The Committee supports this new initiative understands that with $10 million, NASA will still be able to keep the OMV program on the planned schedule of the first vehicle delivery in 1990.

The Committee believes the OMV is an integral element in the Space Shuttle program and will likely be required to service and/or reboost the Space Telescope before it is required for use in conjunction with the space station. Therefore, the Committee believes that, in spite of budgetary pressures, it is important to begin this important element of the required space infrastructure in fiscal year 1986.

Space Science—$1,025,400,000

The Committee authorization for the Space Sciences—Physics and Astronomy, Life Sciences, and Planetary Exploration—is $1,025,400,000, $35 million below the fiscal year 1986 administration request.

Physics and Astronomy—$1,025,400,000

The Committee recommends $608,400,000 for Physics and Astronomy, compared to the administration's request of $630,400,000.

Within the Committee's recommendation for Physics and Astronomy, the Committee specifically authorizes $42,300,000 for Research and Analysis and $119,900,000 for Mission Operations and Data Analysis, both as requested by the Administration. Also, the Committee authorizes $15 million for the Solar Optical Telescope (SOT), $15 million below the administration's request. In addition, to conform to the recommended authorization for Physics and Astronomy, the Committee directs NASA to make a general reduction of $7 million within Physics and Astronomy.

The major objective of the Physics and Astronomy program is to increase our knowledge of the origin, evolution, structure and composition of the universe, including the Sun, the stars, and the other celestial bodies. Space-based research is being conducted to investigate the structure and dynamics of the Sun and its long- and short-term variations; cosmic ray, x-ray, ultraviolet, optical, infrared, and radio emissions from stars, interstellar gas and dust, pulsars, neutron stars, quasars, black holes and other celestial sources; and the laws governing the interactions and processes occurring in the universe. Many of the phenomena being investigated are not detectable from ground-based observatories because of the obscuring or distorting effects of the Earth's atmosphere.

To achieve the objectives of the Physics and Astronomy program, NASA employs theoretical and laboratory research; aircraft, balloon and sounding rocket flights; Shuttle/Spacelab flights; and free-flying spacecraft. Research teams involved in this program are located at universities, industrial laboratories, NASA field centers, and other government laboratories. The scientific information ob-

tained and the technology developed in this program are made available to the scientific communities for the application to and the advancement of scientific knowledge, education and technology.

The Physics and Astronomy missions undertaken to date have been extraordinarily successful, and a number of missions continue to produce a rich harvest of scientific data—the International Ultraviolet Explorer (IUE) and the Solar Maximum Mission (SMM) are still operating, and new scientific results are continually emerging from the analysis of the High Energy Astronomical Observatories and Infrared Astronomical Satellite data sets.

Hubble Space Telescope

The Hubble Space Telescope will make a major contribution to understanding the stars and galaxies, the nature and behavior of the gas and dust between them, and the broad question of the origin and scale of the universe. Operating in space above the atmospheric veil surrounding the Earth, the Space Telescope will increase by more than 1 hundredfold the volume of space accessible for observations. With its significant improvements in resolution and precision in light sensitivity and in wavelength coverage, the Hubble Space Telescope will permit scientists to conduct investigations that could never be carried out using ground-based observatories due to the obscuring and distorting effects of the Earth's atmosphere.

The Hubble Space Telescope will enhance the ability of astronomers to study radiation in the visible and ultraviolet regions of the spectrum. It will be more sensitive than ground-based telescopes and will record greater detail about the objects under study. It will make possible observations of objects so remote that the light will have taken many billions of years to reach the Earth. As a result, we will be able to look far into the distant past of our universe. The Hubble Space Telescope will also contribute significantly to the study of the early state of stars and the formatiom of solar systems, as well as to the observation of such highly-evolved objects as supernova remnants and white dwarfs stars. With the Hubble Space Telescope, we may be able to determine the nature of quasars and the processes by which they emit such enormous amounts of energy, and it may also be possible to determine whether some nearby stars have planetary systems.

The Hubble Space Telescope will be an automated observatory, delivered into orbit by the Space Shuttle. Data from its scientific instruments will be transmitted to Earth via the Tracking Data Relay Satellite System. The Hubble Space Telescope design will permit in-orbit maintenance, repair, and/or retrieval by the Space Shuttle for return to Earth for required refurbishment and then relaunch by the Space Shuttle.

During fiscal year 1984, significant progress was made on the Hubble Space Telescope with the completion of the scientific instrument verification and acceptance program at the Goddard Space Flight Center, delivery of the Optical Telescope Assembly, the Science Instrument Control and Data Handling Unit, the Wide Field/Planetary Camera, the Faint Object Spectrograph and the High Speed Photometer to the Lockheed Missiles and Space Company for assembly and verification into the spacecraft, and the con-

tinued structural and electronic development activities at Lockheed.

In fiscal year 1985, the program focus will be placed on the assembly and verification activities at Lockheed. In addition, completion and delivery of the three flight Fine Guidance Sensors, the High Resolution Spectrograph, and the Faint Object Camera is scheduled.

The fiscal year 1986 funding is required to complete the integration and testing of the total Hubble Space Telescope System before the integrated system is shipped to the KSC for launch in the second half of 1986.

Gamma Ray Observatory

The objective of the Gamma Ray Observatory (GRO) mission is to measure gamma ray radiation from the universe and to explore the fundamental physical processes powering it. Certain celestial phenomena are accessible only at gamma ray energies. The observational objectives of the Gamma Ray Observatory are to search for direct evidence of the synthesis of the chemical elements; to observe high energy astrophysical processes occurring in supernova, neutron stars and black holes; to locate gamma ray burst sources; to measure the diffuse gamma ray radiation for cosmological evidence of its origin; and to search for unique gamma ray emitting objects.

Cosmic gamma rays represent one of the last frontiers of the electromagnetic spectrum to be explored. The low flux levels of gamma ray quanta, and the high background they produce through their interaction with the Earth's atmosphere, coupled with the demand for better spectral, spatial, and temporal resolution of source features, combine to require that large gamma ray instruments be flown in space for a prolonged period. Gamma rays provide unique information on the most intriguing astronomical objects yet discovered, including quasars, neutron stars, and black holes. The GRO is scheduled for launch by the Space Shuttle in 1988. The spacecraft is designed to accommodate four large gamma ray instruments and will be designed to allow for rendezvous with the Space Shuttle and refueling by the Space Shuttle or the OMV. Because of the necessity for long exposures, the spacecraft will be pointed in a fixed direction in space for periods of a few hours up to two weeks at a time.

In fiscal year 1984, NASA held critical design reviews for the instruments, and the preliminary design review for the spacecraft. In addition, it began fabrication of the spacecraft and instrument hardware. In fiscal year 1985, NASA will hold the spacecraft critical design review. All subsystem fabrication will be underway in fiscal year 1985 and the fabrication of the spacecraft flight structure will be initiated.

The fiscal year 1986 funding is required for calibration of the science instruments; for continuation of the spacecraft fabrication and delivery of the Command and Data Handling system; and for continuation of the ground operations preparations.

Shuttle Spacelab Payload Development and Mission Management

The objectives of Shuttle/Spacelab payload development and mission management are to develop instruments to conduct experiments and acquire new knowledge in the disciplines of physics and astronomy, to develop experiment interface hardware for material processing, to develop sounding rocket class payloads for flight on the Space Shuttle and to manage the mission planning and execution of all NASA Spacelab payloads. This project supports the development of all physics and astronomy experiments, the system management and engineering development of the flight equipment and software, the payload specialist training and support, the physical integration of the payload with the Spacelab system, the operation of the payloads during flight, the dissemination of data to experimenters, and the analysis of physics and astronomy flight data. In addition, this project funds the mission management efforts for all NASA Spacelab payloads.

Instruments are currently under development for several Shuttle/Spacelab missions with primary emphasis on physics and astronomy. These instruments are divided into two classes: multiuser instruments and principal investigator instruments. The multiuser instruments are those instruments that have a broad capability, can accommodate a number of principal investigator-furnished instruments, and have a larger user community. The principal investigator instruments are those proposed for a specific scientific investigation by a single investigator who may not have coinvestigators. Spacelab-2, which is the second verification flight of the European-built Spacelab, is scheduled for launch in mid-1985. The objectives of Spacelab-2 are to verify the Spacelab igloo and pallet systems and to obtain scientific data, with emphasis on astrophysics and solar physics. The Instrument Pointing System, developed by the European Space Agency, will be flown for the first time on the Spacelab-2 mission.

Three ultraviolet telescopes are also currently in development leading to a launch in 1986 (ASTRO–1). This mission is designed to conduct investigations in ultraviolet imaging, spectrophotometry, and polarimetry at very high resolution. The ASTRO–1 mission will also carry two widefield cameras to conduct unique scientific observations of Halley's Comet in the near earth environment. ASTRO–1, as well as reflights of this instrumentation, are designed to allow scientific investigations of a broad range of objects, from nearby comets and planets to the most distant quasars.

The SOT, which is a multiuser instrument facility, is currently in the definition and preliminary design phase. The development phase is planned to begin in fiscal year 1985, leading to a launch in the early 1990's. The SOT will provide extremely high resolution images of the Sun's surface and atmosphere, permitting for the first time masurement matched to the spatial scale of fundamental solar phenomena.

Spacelab 3, primarily a materials processing and life sciences mission, was flown in April 1985.

In fiscal year 1986, mission management of the Spacelab mission will continue. Development of the SOT and the Space Plasma Lab will continue. Mission management for the nonphysics and astrono-

my missions includes all Spacelab efforts except instrument development and data analysis. Effort will continue on the Shuttle High Energy Astrophysics Lab. Fiscal year 1986 funding also is required for the development of low-cost sounding rocket class payloads which will be flown on the Space Shuttle to provide more flight opportunities to the science community.

Explorer development

The Explorer program provides the principal means of conducting investigations of stellar physics and of the near-Earth interplanetary environment having limited, specific objectives and not requiring major observatories. Included in the present program are missions to study atmospheric and magnetospheric physics; the several magnetospheric boundaries; interplanetary phenomena; cosmic ray investigations; and x ray, ultraviolet, and infrared astronomy. Studies are conducted to define future high priority science explorer missions. NASA engages in cooperative missions with other Federal agencies and other nations whenever this cooperation will assist in achieving mission objectives.

Solar terrestrial and atmospheric explorers provide the means for conducting studies of the Earth's near-space environment. The program requires a wide variety of satellites in orbits extending from the very lowest reaches of the upper atmosphere, to the interplanetary medium beyond the Earth's magnetosphere. Efforts in fiscal year 1984 included launch of the Active Magnetospheric Particle Tracer Explorer (AMPTE). The AMPTE, a cooperative project with the Republic of Germany and the United Kingdom, consists of two spacecraft and one sub-satellite. The mission is studying the solar wind at the subsolar point and will identify particle entry windows, energization processes, and transport processes into the magnetosphere. The San Marco-D mission, a cooperative project with Italy, which is scheduled for a fiscal year 1985 launch, will include a group of United States experiments to study the relationship between solar activity and the Earth's meteorological phenomena.

Astrophysics explorers have been instrumental in conducting the first astronomical sky surveys in the gamma ray, x ray, ultraviolet and low frequency radio regions of the electromagnetic spectrum. A prime example is the Infra-Red Astronomical Satellite, which has just completed a highly successful survey mission.

In fiscal year 1985, development will continue on the Cosmic Background Explorer (COBE) and on the x ray imaging instrument to be flown on the German Roentgen Satellite (ROSAT). COBE will carry out a definitive all-sky exploration of the diffuse cosmic background radiation of the universe between the wavelengths of 1 micrometer and 9.6 millimeters. The detailed information that COBE will provide on the spectral and spatial distribution of low energy background radiation is expected to yield significant insights into basic cosmological questions of the origin and evolution of the universe.

ROSAT, a cooperative project between the Federal Republic of Germany and the United States, will perform high resolution imaging studies of the x ray sky. The United States will provide a high

resolution imaging instrument and launch services, and Germany will provide the spacecraft and other instrumentation.

In response to an innovative suggestion from industry, NASA is considering a new approach to providing a spacecraft platform for the Extreme Ultraviolet Explorer (EUVE) and other future explorers. Under this approach, NASA would obtain spacecraft services through a privately owned and developed platform, which could be shared with commercial users. A request for proposal was released by NASA to industry in January 1985.

Work also is continuing in fiscal year 1985 on the Cosmic Ray Isotope Experiment (CRIE). The CRIE sensor, which will be launched in 1986 on a DOD spacecraft, will study galactic cosmic rays and accelerated nuclei from solar flares. In addition, instrumentation development is being continued for reflight of the Long Duration Exposure Facility to gather data on the relative energies and abundances of the rare heavy cosmic ray nuclei. This spacecraft is scheduled to be launched in 1986 by the Space Shuttle, with subsequent retrieval about 2½ years later.

Fiscal year 1985 funding will also support definition studies of potential future explorer missions, including the x ray Timing Explorer and the Far Ultraviolet Spectroscopy Explorer.

Fiscal year 1986 funding is required for the continuation of COBE development activities leading to a launch in 1988. During fiscal year 1986, the COBE science instrument fabrication will be completed. The COBE cryogenic device and all other major system elements will be delivered beginning in late 1986. Fiscal year 1986 funding is also required for continuation of EUVE design and development activities and for continuation of development activities on experiments which will be flown on the German ROSAT mission in 1987 and on a DOD satellite in 1986.

Mission operations and data analysis

The purpose of the mission operations and data analysis effort is to conduct operations and to analyze data from the physics and astronomy satellites after launch. This program also supports the continued operation of a number of spacecraft, after their originally planned objectives have been achieved, for purposes of conducting investigations that have continuing, high scientific significance. The funding supports the data analysis activities on the many investigators at universities and other research organizations associated with astrophysics and solar terrestrial operational satellite projects. Actual satellite operation, including operation control centers and related data reduction and engineering support activities, are typically carried out under a variety of mission support or center support contracts.

In addition to the normal support required for mission operations, the Hubble Space Telescope program encompasses several unique aspects which must be provided for well in advance of launch. The Hubble Space Telescope is designed for operation for more than a decade using the Space Shuttle/Orbital Maneuvering Vehicle combination or the space station for on-orbit maintenance of the spececraft and in-orbit replacement or repair of the scientific instruments. The Hubble Space Telescope will be used primarily by observers selected on the basis of proposals submitted in response

to periodic solicitations. Science operations will be carried out through an independent Space Telescope Science Institute. The Institute will operate under a long-term contract with NASA. NASA will retain operational responsibilities for the observatory, and the Institute will implement NASA policies in the areas of planning, management, and scheduling of the scientific operations of the Hubble Space Telescope.

Fiscal year 1986 funds will provide support for the continued mission operations and data analysis activities for the International Ultraviolet Explorer, and continued analysis of the extensive data obtained by the Infrared Astronomical Satellite and the High Energy Astronomy Observatories. Fiscal year 1986 funding will provide for the continued operation and analysis of data collected from the repaired Solar Maximum Mission, and preparation for the operation of the Hubble Space Telescope. In fiscal year 1986, the development of mission operations procedures as well as development of the science operations ground system for the Hubble Space Telescope will be continued. The Hubble Space Telescope Science Institute activities such as the development of the Guide Star Selection System and Science Data Analysis Software will be continued, and will lead to initial operational capability. In fiscal year 1986, maintenance and refurbishment preparation activities such as the purchase of orbital replacement units and space support equipment will be continued so that NASA can service the Hubble Space Telescope in orbit.

Research and analysis

The research and analysis program provides for the research and technology necessary to define, plan, and support flight projects. Preliminary studies to define missions and payload requirements are carried out as are theoretical and ground based supporting research and advanced technology development. Activities included are supporting research and technology, advanced technology development and data analysis.

During fiscal year 1986, the supporting research and technology program will support those tasks which contribute to maintaining a firm base for a viable physics and astronomy program. Emphasis will continue on infrared detector development and on expansion of technology activities related to large x ray mirrors, advanced x ray detectors, gamma ray spectrometers, and instrumentation. Emphasis will also be placed on the development of a large array microchannel plate, and on intensified charge-coupled imagery devices. In the area of solar physics, activities will support the Solar Maximum Mission, especially through theoretical studies of high energy phenomena. Development of advanced generation instrument concepts will continue, especially for the extreme ultraviolet and x ray wavelengths and for analyzing the structure and dynamics of the solar interior.

Fiscal year 1986 funding will also support continued feasibility and definition studies on future potential candidate missions such as the Advanced X ray Astrophysics Facility, Gravity Probe-B mission, and the Space Infrared Telescope Facility. In the data analysis activities to be carried out at universities and government research centers in fiscal year 1986, emphasis will be placed on cor-

relative studies involving data acquired from several sources (spacecraft, balloons, sounding rockets, research aircraft and ground observatories).

Suborbital programs

The suborbital program provides versatile, relatively low-cost research tools that complement the capabilities of balloons, aircraft, free-flying spacecraft, and the Space Shuttle in all the space science disciplines, including the study of the Earth's ionosphere and magnetosphere, space plasma physics, stellar astronomy, solar astronomy, and high enegy astrophysics. These programs are done by both domestic researchers and in corporation with international researchers.

Committee Comments

The Committee regrettably authorizes only $15 million of the administration's $30 million request for the SOT. Since SOT is not time-sensitive and because it is in an earlier, less vulnerale phase of its program life, its fiscal year 1986 authorization is reduced to accommodate budgetary pressures. The Committee, nonetheless, continues to support SOT as the major initiative in solar physics for the remainder of the century. The Committee expects that this $15 million reduction, in and of itself, should not significantly affect the currently scheduled launch date of mid-1991.

The quality of NASA's Physics and Astronomy program, the return that our Nation receives from its investment in Physics and Astronomy missions, and the health of our university space science programs depend on the Physics and Astronomy Research and Analysis program. Because it recognized the significance of the Physics and Astronomy Research and Analysis program to the Nation's space science infrastructure, the Committee authorizes the administration's fiscal year 1986 request for Research and Analysis, $42,300,000.

The Committee believes that, in spite of the present budgetary climate, it is important to maximize the return on our investment in such large observatories as the IRAS and SMM, and the Hubble Space Telescope, which is scheduled for an August 1986 launch. Accordingly, the Committee recommends the administration's fiscal year 1986 budget request for Mission Operations and Data Analysis, $119,000,000.

Consistent with its position in prior years, the Committee maintains its strong support for the Advanced X ray Astrophysics Facility and the Space Infrared Telescope Facility, the number one priority observatories in their respective fields of x ray astronomy and infrared astronomy. The Committee recognizes that "freezing" NASA's budget will likely have an adverse effect on the Advanced Technology Development efforts of these two programs. Nevertheless, the Committee encourages NASA to maintain to the greatest extent possible the infrastructure associated with these two programs to avoid any further departure from their respective schedules.

The Committee continues to support Gravity Probe-B as the leading free-flyer relativity mission for the 1980's. This program has

made significant progress during the past year and the Committee urges NASA to give Gravity Probe-B every consideration possible for a new start in fiscal year 1987, within available resources.

In the past, the Committee has urged NASA to assume a greater role in upgrading university laboratory research equipment. The Committee notes with concern, however, that NASA may not have taken on its share of this responsibility, an omission which will adversely affect our university space science programs and, ultimately, NASA's space science efforts. the Committee, once again, urges NASA to target this problem and make a concerted effort to help restore our university laboratory research equipment to a more productive state of use. The Committee expects to be kept informed about NASA's plans and efforts on this issue.

LIFE SCIENCES—$68,000,000

The Committee has authorized $68 million for fiscal year 1986, $4 million below the administration's budget request.

The goals of the Life Sciences program are to provide a sound scientific, medical, and technical basis for safe and effective manned space flight, and to advance the understanding of the basic mechanisms of biological precesses by using the unique capabilities of the space program. Results from the research program are applied to: the immediate needs in the maintenance and health of the astronauts; understanding the response of biological systems to weightlessness; the design of the advanced life support systems fo use on future missions; and understanding the biosphere of the planet Earth, its origin, evolution, and present state.

The Life Sciences program is the key to sustaining a permanent manned presence in space and to using the space environment to study living systems. These activities include both ground-based and space research efforts, which are mutually supportive and integrated, and use a composite of disciplines and techniques in both biology and medicine to address space-related medical problems and fundamental biological processes.

Life Sciences Flight Experiments

The objective of the Life Sciences Flight Experiments program is to assimilate information and scientific questions from the various life sciences disciplines and translate them into payloads designed to expand our understanding of the basic physiological mechanisms involved in adaptation to weightlessness. The program includes selection, definition, inflight execution, data analysis, and reporting of medical and biological investigations.

Current activities involve the development of life sciences flight experiments to be flown on Spacelabs-2 and -4 and the first dedicated Life Sciences Spacelab mission (Space, Life Sciences-1) (SLS–1). Most of the experiments onboard the early Shuttle flights will serve as pathfinding activities for SLS–1. Activities on Spacelab-3, which was flown in April, involved evaluation of functional performance and compatibility of hardware that is essential to human and animal investigations which will be conducted on SLS–1 and follow-on missions. Hardware development and mission planning activities are proceeding on schedule for the U.S. vestibular experi-

ment which will be flown on the German-D1 mission; these are follow-up investigations to those conducted on Spacelab-1 in 1983.

Eighteen investigations have been tentatively selected for flight on SLS–1 with six more investigations to be conducted on later flights. The definition phase activities have been completed and the design and development of the flight hardware is well underway.

Fiscal year 1986 funding is required for the continued definition and development of hardware which will be flown on future Spacelab missions; i.e., SLS–1 German-D1, and the second dedicated life sciences mission. Flight hardware integration and experiment development associated with Spacelab-2, -3, and D-1 will be completed in preparation for launches in 1985. The SLS–1 mission is under review. This mission originally was scheduled for launch in early 1986. In addition, the selection process for experiments for the follow-on dedicated Spacelab life sciences missions has been initiated through the release of a new flight Announcement of Opportunity and experiment proposals are now being evaluated.

Research and analysis

The research and analysis activity of the Life Sciences program is concerned with ground-based and pre-flight research in basic biology and in those medical problem areas that affect manned space-flight. The program is comprised of five elements: (1) space medicine; (2) advanced life support systems research; (3) gravitational biology; (4) exobiology; and (5) biospheric research.

The Life Sciences Space Medicine program is responsible for bringing the technology and practice of medicine to bear on solving the problems of sustaining, supporting, and protecting individuals working in the space environment. The Advanced Life Support Systems research program concentrates on enhancing our ability to support long-duration manned presence in space and on optimizing the productivity of the STS crews.

The Gravitational Biology program explores the role of gravity in life processes and uses gravity as an environmental tool to investigate fundamental biological questions. The Exobiology program is directed toward furthering our understanding of the origin and evolution of life, and life related molecules, on Earth and elsewhere in the universe. The Biospheric Research program explores the interaction between the biota and the contemporary environment to develop an understanding of global biogeochemical cycles.

In fiscal year 1985, Life Sciences Reserch and Analysis activities will support continued efforts in the five program areas described above and will emphasize the formulation of improved approaches to the operational management of space adaptation syndrome.

Committee Comments

The reduction of $4 million in the Committee's authorization below the administration's budget request is a general reduction in the Life Sciences program.

The Committee views with concern the recent removal of the SLS–1 mission from the Space Shuttle manifest. The Committee recognizes the ongoing scheduling difficulties in the Shuttle manifest, but the Committee also believes that mission deserves a

higher priority than that of "mission of opportunity." Biomedical research has assumed and will continue to assume a significant role as NASA increases the Shuttle flight rate and as the space station program evolves. The fact that SLS–1 is the first dedicated life sciences Spacelab mission underscores the significance of a timely launch and also points out the delays that have already occurred in this mission. The Committee urges NASA to conduct that mission in as timely a manner as possible to avoid further delays and to adhere to the greatest degree possible to the scheduled launch of SLS–2 which is currently manifested for February, 1987.

Planetary Exploration—$349,000,000

The Committee authorization of $349 million for Planetary Exploration in fiscal year 1985 is $10 million below the administration's request. Within Planetary Exploration, the Committee specifically authorizes $33,000,000 for the Mars Observer program, $10 million below the administration's request; $95 million for Mission Operations and Data Analysis; and $62,900,000 for Research and Analysis.

Summary of funding levels, fiscal year 1986

Galileo Development	$39,700,000
Venus Radar Mapping Mission	112,000,000
Ulysses (ISPM)	5,600,000
Mars Observer (MGCO)	33,800,000
Mission Operations and Data Analysis	95,000,000
Research and Analysis	62,900,000
Total	349,000,000

The Planetary Exploration program encompasses the scientific exploration of the planets and their satellites, comets, and asteroids, and the interplanetary medium. The program objectives are: (1) to determine the nature of planets, comets, and asteroids as a means of understanding the origin and evolution of the solar system; (2) to understand the Earth better through comparative studies with the other planets; (3) to understand how the appearance of life in the solar system is related to the chemical history of the system; and (4) to provide a scientific basis for the future use of resources available in near Earth space. The projects undertaken in the past have been highly successful. The strategy that has been adopted calls for a balanced emphasis on the earth-like inner planets, and giant gaseous outer planets, and the small bodies (comets and asteroids). Missions to these planetary bodies start at the level of reconnaissance and exploration to achieve the most fundamental characterization of the bodies, and proceed to a level of more detailed study.

The reconnaissance phase of inner planet exploration began in the 1960's and has now been completed, although we still know little about the nature of the Venus surface. Mars has provided program focus because of its potential as a site of bilological activity. The Viking landings in 1976 carried the exploration of Mars forward to a new level of scientific and technological achievement, thereby setting the stage for the next step of detailed study. Analyses of meteorities and the moon rock samples returned by Apollo

continue to be highly productive, producing new insights into the early history of the inner solar system and revision theoretical concepts. The continuing Pioneer Venus mission is carrying the study of the Earth's nearest planetary neighbor and closest planetary analogue beyond the reconnaissance stage to the point where we have made a basis characterization of the massive cloud-covered atmosphere of Venus, including fundamental data about the formation of the planet.

The exploration of the giant outer planets began relatively recently. The Pioneer-10 and 11 flybys to Jupiter in 1973 and 1974 were followed by the Voyager-1 and 2 spacecraft encounters in 1979. Voyager-1 then encountered Saturn in November 1980 and Voyager-2 did the same in August 1981. The Voyager data on these planets, their satellites, and their rings have revolutionized our concepts of the formation and evolution of the solar system. Now, the Pioneer-10 and 11 and Voyager-1 spacecraft are on escape trajectories from the solar system and will continue to return scientific data about the outer reaches of the solar system. The Voyager-2 spacecraft is headed for an encounter with Uranus in 1986 that will provide our first look at this giant outer planet. Its trajectory then will carry the spacecraft on to Neptune in 1989.

Galileo development

The Galileo orbiter/probe mission will be launched to Jupiter in 1986 by the Space Shuttle/Centaur Upper Stage. The comprehensive science payload is expected to extend our knowledge of Jupiter and its system of satellites well beyond the profound discoveries of the Voyager and Pioneer missions. During 20 months of operation in the Jovian system, Galileo will have the capability to provide as many as eleven targeted encounters with the Galilean Satellites. However, the number of tour orbits at Jupiter will be decreased by one orbit if the decision is made after launch to incorporate a flyby of the asteroid Amphritrite. If the asteroid flyby is incorporated, the plan is to extend the length of the Jupiter tour from 20 months to 22 months to permit the achievement of all major objectives previously encompassed by the eleven orbit tour.

During fiscal year 1985, major activities of the Gelileo program will involve completion of the environmental test cycle, retrofit to selected subsystems with more radiation resistant electronic components, and completion of development of the flight software.

The fiscal year 1986 funding will provide for completion of the integration and testing, the prelaunch checkout at the Jet Propulsion Laboratoy and for the prelaunch and launch activities at the Kennedy Space Center in support of the May, 1986 launch. Funding in fiscal year 1986 will also be used for the final development of the ground systems and the associated software to support mission operations. In addition, fiscal year 1986 funds are required to reimburse the Department of Energy (DOE) for completing development of the Radioisotope Thermoelectric Power Generators required for the orbiter.

Venus Radar Mapper

The Venus Radar Mapper (VRM) mission, initiated in fiscal year 1984, will provide global maps of the cloud-shrouded surface of

Venus. The VRM, using a synthetic aperture radar, will obtain global radar imagery of Venus with resolution sufficient to address fundamental questions regarding the origin and evoluation of the planet. VRM will also obtain altimetric and gravity data to determine accurately the gravity field, internal stresses, and density variations of the planet's interior. This data will be analyzed so that the evolutionary history of Venus can be compared with that of the Earth. The VRM, scheduled for launch in 1988 on the Shuttle/Centaur Upper Stage, will map virtually the entire planet in 243 days.

During fiscal year 1985, major activities will include completion of final spacecraft and instrument systems design, testing breadboard development models of the radar circuits, building and development model of the radar, and preparing the detailed designs of the spacecraft subsystems.

Fiscal year 1986 funds will provide for completion of all design efforts for the spacecraft, radar instrument, and mission operations lead Voyager program. Spare flight computers and other equipment will be obtained from the Galileo launch in 1986.

Ulysses (Formerly International Solar Polar Mission)

Ulysses is a joint NASA and ESA endeaveor that will fly a package of experiments to invetigate the Sun at high solar latitudes that cannot be studied from the Earth's orbit. Ulysses, which will provide data on the effects of solar activity on the Earth, will be launched in 1986 on the Shuttle/Centaur Upper Stage.

ESA will provide the spacecraft and some instrumentation and the United States will provide the remainder of the instrumentation, the launch, tracking support, and the radioactive thermal power generators. The mission is designed to obtain the first view of the Sun above and below the plane in which the planets orbit the Sun. The mission will study the relationship between the Sun and its magnetic field and particle emissions (solar wind and cosmic rays) as a function of solar latitude, thereby providing an insight into the effects of solar activity on the Earth's weather and climate.

The Ulysses Mission was restructured in fiscal year 1981, from a two-spacecraft mission—one provided by the United States and one provided by ESA—to a single ESA spacecraft mission.

United States' participation in the program remains substantial however. NASA is developing five of the nine principal investigator instruments and three of the four European investigations have U.S. coinvestigators.

During fiscal year 1983, the U.S. flight instruments were delivered to the ESA spacecraft developer for integration and system testing. All spacecraft testing has been completed, and the spacecraft is being partially disassembled for storage until launch.

The fiscal year 1986 funding is required to support U.S. principal investigators in their mission planning, and is required for retrofitting of the U.S. instruments with the spacecraft prior to shipment to the KSC. In addition, fiscal year 1986 funds are required to complete the ground system development activities and to reimburse DOE for the continued development of the Radioisotope Thermoelectric Power Generators.

Mars Observer Mission (Formerly Mars Geoscience/Climatology Orbiter)

The Mars Observer mission is the first planetary mission using a new approach to low-cost inner solar system mission exploration. This approach, which was recommended by the Solar System Exploration Committee, starts with a well-defined and focused science objective and makes use of high inheritance, modified production line Earth-orbital spacecraft. The objective of the Mars Observer Mission is to extend and complement the data acquired by the Mariner and Viking missions by mapping the global surface composition, atmospheric structure and circulation, topography, figure, gravity, and magnetic fields of Mars to determine the location of volatile reservoirs and characterize their interaction with the Martian environment.

The Mars Observer Mission will be launched in 1990 using the Space Shuttle and will be inserted into Martian orbit in 1991 to perform geochemical, geophysical, and climatological mapping of the planet over a period of 2 years.

The fiscal year 1986 funds are required for the continued design and development activities leading to the preliminary design review in late fiscal year 1986. This spacecraft design is a modified Earth-orbital spacecraft design. Fiscal year 1986 funding is also required for initiation of design and development activitries for experiments selected in response to the Announcement of Opportunity. In addition, development activities will be continued in fiscal year 1986 on the x band transponder to be flown on the Mars Observer mission.

Mission Operations and Data Analysis

The objectives of the mission operations and data analysis activities are in-flight operation of planetary spacecraft and the analysis of date from these missions. Currently, two major classes of planetary spacecraft are operating—the Pioneer and the Voyager spacecraft.

The two Voyager spacecraft are now traveling through the outer solar system on trajectories that will take them into interstellar space. Voyager-1 continues to provide data on the interplanetary medium in that distant part of the solar system. In January, 1986, Voyager-2 will make a close flyby of the planet Uranus, the first time this planet has ever been visited by a spacecraft. The observatory phase of this encounter, beginning in November, 1985, include detailed observations of the planet, its rings, and moons. After the Uranus encounter is completed, the spacecraft will continue on to the planet Neptune, where, in 1989, it will provide us with our first close look at this distant planet.

Pioneer 10 and 11 will continue to explore the outermost solar system. Pioneer 10 will soon enter the unexplored region beyond Pluto where the Sun's influence is secondary to those of true interstellar space. These spacecraft will continue the search for gravitational evidence of a tenth planet. Pioneer 6–9 are still collecting information on the interplanetary magnetic field and solar wind as they orbit the Sun. In 1986, these spacecraft will be used to observe Comet Halley as it passes in their vicinity.

The Pioneer Venus orbiter continues to obtain data from Venus' atmosphere and magnetosphere. In early 1986, the spacecraft's spin axis will be adjusted to allow ultraviolet observation of Comet Halley. The Pioneer Venus will be the only spacecraft able to observe the Comet at its closest approach to the Sun and will provide critical additions to data from foreign spacecraft making observations at other points in the Comet's orbit.

Fiscal year 1986 funding is required for the continued operation and data analysis activities in support of the Voyager and Pioneer operations. In addition, the Voyager Neptune encounter activities will start in April 1986. Planetary flight support funding is required in fiscal year 1986 for preparation of the 1986 launches of Galileo and Ulysses as well as for the Voyager Uranus encounter. In addition, the fiscal year 1986 funding is required for the operation of the Galileo and Ulysses missions, both of which will be launched in May 1986.

Research and analysis

The research and analysis program contains four elements required (1) to assure that data and samples returned from flight missions are fully exploited; (2) to undertake complementary laboratory and theoretical efforts; (3) to define science rationale and develop required technology to undertake future planetary missions; and (4) to coordinate an International Halley's Comet Watch and provide co-investigator support to the European Space Agency's Giotto Mission to Halley's Comet.

The International Halley's Comet Co-Investigations and Watch will capitalize on the opportunity to observe Comet Halley during its next apparition in 1985–86 by supporting co-investigators on the ESA's Giotto mission, and by conducting complementary remote-sensing investigations using both Earth-orbiting and ground-based facilities. The Giotto mission will fly by Halley's Comet in 1986. Concurrently, an observation program called the International Halley Watch, coordinated by the United States, will conduct worldwide scientific observations of the Comet Halley. The Research and Analysis funding provides for, among other things, the continued operation of the Infrared Telescope facility on Mauna Kea. HI.

Committee Comments

The Committee's recommended $10 million reduction below the administration's budget request for the Mars Observer program in no way indicates any lessening of the Committee's support for the Mars Observer program. The Committee continues to support fully this mission, its objectives, and its high priority as established by the Solar Systems Exploration Committee (SSEC). Furthermore, the Committee continues to support the SSEC's innovative approach of using spacecraft inheritance and commonality of systems and personnel for its core program of planetary missions. The Committee expects that the recommended authorization for the Mars Observer program will still permit NASA to meet the currently scheduled 1990 launch. The funds authorized in fiscal year 1986

also should permit NASA to proceed with the spacecraft contracts as well as the contracts for the science instruments.

The Committee notes the apparent direction that the Soviet Union is proceeding with its planetary program and, in particular, with its planned Mars Phobos mission, scheduled for a 1988 launch. Although the Mars Observer mission is scheduled for launch in 1990, there still may be opportunities for cooperation between some aspects of the Mars Observer and Mars Phobos missions, along with other future Mars-related missions. To this end, the Committee requests that NASA prepare a report by December 31, 1985, in association with non-Government space scientists, examining the opportunities for joint East-West Mars-related activities, including an unmanned Mars sample return and all activities that might contribute to an international manned mission to Mars.

Recognizing the significance of a Voyager encounter with Uranus in 1985 and with Neptune in 1989, the Committee believes that complete funding of the administration's 1986 budget request for Mission Operations and Data Analysis (MO&DA) activities is warranted. In addition, the scheduled launches in 1986 of Galileo and Ulysses will require maximum funding in MO&DA to optimize the scientific return of these two missions.

Recognizing that NASA's Space Science Research and Analysis activities are the lifeblood of many university and college space science programs and that for years funding for Planetary Exploration Research and Analysis has not grown commensurately with the rest of NASA's budget, the Committee authorizes the fiscal year 1986 administration budget request of $62,900,000 for Planetary Exploration Research and Analysis.

The Committee notes that the first of the SSEC's Mariner Mark II missions, the Comet Rendezvous/Asteroid Flyby, will be competing for a new start approval in the fiscal year 1987 budget. Recognizing the time sensitivity of the CRAF mission, the Committee strongly supports it as one of several new starts in fiscal year 1987 and urges NASA to give this program additional consideration due to the unique nature of this unprecedented comet encounter.

Space Applications

Solid Earth Observations—$70,600,000

The Committee authorization of $70,600,000 is $4,300,000 below the administration's request of $74,900,000. Within Solid Earth Observations, the Committee authorizes $20,100,000 for Research and Analysis, as requested by the administration.

The objectives of the Solid Earth Observations program are to use space observations and experiments to understand the global, physical, chemical, and biological processes involving the land areas of the Earth and the interactions of these land areas with the Earth's oceans and atmosphere; to improve our ability to evaluate the composition and geometry of the Earth's mineral and energy resources; and to increase our understanding of the Earth, its interior structure and composition, its rotational dynamics, the processes related to the movement and deformation of its crust,

and the mechanisms associated with the occurrence of earthquakes.

Principal elements of the program include the development of spaceborne and supporting ground systems; improved data processing and analysis techniques; sensor and technique development; as well as basic and applied research for identifying, monitoring, analyzing, and modeling the vegetated, geological, and geophysical features of the Earth.

The objective of the Shuttle/Spacelab payload development project is to develop, test, and evaluate Earthviewing remote sensing instruments and systems to obtain data for solid Earth observations research. The Shuttle Imaging Radar, which was flown on the Shuttle in October 1984, has demonstrated the utility of spaceborne imaging radar for geologic exploration. The Large Format Camera, required for high resolution mapping applications, was flown successfully on the Shuttle in 1984 and an additional reflight of the camera is planned for 1986. The next generation Shuttle Imaging Radar, involving use of SIR–B components and multi-polarized, dual frequency instruments, is under consideration.

Studies of the movement and deformation of the Earth's crust, the rotational dynamics of the Earth, and the Earth's gravity and magnetic fields provide information which is needed; to understand the processes leading to the release of crustal strain in the form of earthquakes, to improve our understanding of the formation of mineral deposits, to contribute the long-term weather and climate forecasting, and to understand better the Earth as a planet. Space techniques such as laser ranging to satellites and the Moon, and very long baseline interferometry using radio stars or satellites, are the only methods which can provide the precise measurements needed for these studies.

Advanced spectrometer technology development activities include fundamental research in remote sensing. This involves developing an imaging spectrometer and some continuing development of multispectral linear array technology. The imaging spectrometer and multilinear array solid-state sensor research focuses on the development of such features as electronic scan, inherent geometric and spectral registration, and programmable high spatial and spectral resolution. The critical technology development and supporting research on the linear array focal plane and the Shuttle Imaging Spectrometer will continue in fiscal year 1986.

Landsat-4 was launched on July 16, 1982, to provide Multispectral Scanner and Thematic Mapper images for many applications in civil remote sensing. NOAA assumed operational responsiblity for the Landsat-4 spacecraft and the Multispectral Scanner in January 1983, and for Thematic Mapper operations and data processing in August 1984. The Landsat-5 spacecraft was modifed before its launch in March 1984 to correct for anomalies developed in-orbit on Landsat-4.

Committee Comments

The continued uncertainty of the U.S. Government's involvement in remote sensing in space creates an even more compelling reason for a vigorous NASA research and development effort in remote

sensing. The Committee, therefore has authorized the administration's request of $20,100,000 in Research & Analysis. Despite the approved contract between EOSAT and the Department of Commerce to privatize the existing Federal Landsat system, a gap in the availability of new Landsat data seems inevitable. Also, foreign nationals are about to orbit competing land remote sensing systems which, in some respects, will be superior to our own and will make our competitive position difficult.

The Committee believes that if the United States is to ensure for years to come its long-term would leadership in land remote sensing technologies, NASA should assume the responsibility of advancing our Nation's remote sensing capabilities. Therefore, the Committee urges NASA to focus its remote sensing research and development activities with the objective of ensuring a continuous and stable strategy for U.S. Government involvement in remote sensing.

The Committee expects NASA to accommodate a reduction of $4,300,000 below the administration's request as a general reduction in Solid Earth Observations.

Environmental Observations—$291,000,000

This Committee recommendation for Environmental Observations, $291 million, is $26,500,000 below the administration's request of $317,500,000 and includes a general reduction of $1,500,000. Within Environmental Observations, the Committee specifically authorizes $26,700,000 for the Scatterometer program and $114 for the Upper Atmosphere Research Satellite program.

The objectives of NASA's Environmental Observations program are to improve the understanding of processes in the magnetosphere, atmosphere, and the oceans; to provide space observations of parameters involved in these processes; and to extend the national capabilities to predict environmental phenomena, both short- and long-term, and their interaction with human activities. Because many of these phenomena are global or regional, they can be most effectively, and sometimes solely, studied from space. NASA's program includes scientific research efforts plus the development of new technology for global and synoptic measurements. NASA's research satellites provide a unique view of the radiative, chemical, plasma acceleration, and dynamic processes occurring in the magnetosphere, atmosphere, and oceans.

To achieve these goals, a number of significant objectives have been established for the next decade. These include advancing the understanding of the upper atmosphere through the determination of the spatial and temporal distribution of ozone and select nitrogen, hydrogen, and chlorine species in the upper atmosphere and their sources in the lower atmosphere; optimizing the use of space-derived measurements in understanding large scale weather patterns; advancing our knowledge of severe storms and forecasting capabilities, ocean productivity, circulation, and air-sea interactions; improving the knowledge of seasonal climate variability leading to a long-term strategy for climate observation and prediction; and enabling a comprehensive understanding of the solar terrestrial processes and a detailed determination of the physics and cou-

pling between the solar wind, magnetosphere, ionosphere, and the atmosphere.

Atmospheric Dynamics and Radiation Research and Analysis

Fiscal year 1986 funding for Atmospheric Dynamics and Radiation Research and Analysis is required to conduct aircraft flights to study the detail of flows around thunderstorms and fronts, continue comparison of models, study atmospheric scale interactions, and develop techniques to display model outputs in 3-dimensions. In fiscal year 1986 three major interagency field experiments will significantly improve our understanding of the atmosphere for air/ocean interaction which generate crippling New England snowstorms (GALE), the physics of small strong downdrafts called microbursts which are on the scale of tornadoes (MIST), and the mechanism of regional precipitation quantification (SPACE) through space, aircraft, radar balloon, and surface-based observations. Other activities will involve continued retrieval and archiving of global International Satellite Cloud Climatology Project data sets, analysis of data from the Earth Radiation Budget Experiment and the Stratospheric Aerosol and Gas Experiment, and continued ground-based and rocket flight support for solar irradiance monitoring. Technology development of active temperature, pressure, and moisture sounders as well as basic Laser-Radar technology development will also be continued in fiscal year 1986.

Oceanic processes research and analysis

In fiscal year 1986, Oceanic Processes Research and Analysis activities will concentrate on the experimental design for the World Ocean Circulation Experiment and the Tropical Ocean and Global Atmosphere program, as well as on the development of numerical models and associated data assimilation techniques for use in determining the general circulation of the oceans. In biological oceanography, the analysis of data from Nimbus-7 will be continued to help with the conceptual design of the Global Flux Experiment. In addition, NASA will conduct the preliminary design of the Ocean Color Imager, including accommodation studies for the NOAA-K and SPOT-3 spacecraft. In polar oceanography, NASA will emphasize experimental design for the Arctic Basic research effort (POLESTAR), and will work with the World Data Center for Snow and Ice on processing and archival of microwave radiometer data. NASA will also determine how to process synthetic aperture radar data from the ERS-1 satellite. In addition, the transition of the Pilot Ocean Data System from a technical demonstration to a scientific support facility will be completed in fiscal year 1986. NASA will complete interagency coordination with the Office of Naval Research, the National Science Foundation, and NOAA for the use of spaceborne observing techniques in oceanographic research, including the definition of interfaces between the Pilot Ocean Data System and the computing facilities and data archives of other agencies.

Space physics research and analysis

During fiscal year 1985, the Space Physics Research and Analysis activities will be continued with particular emphasis on the analy-

sis of data from ISEE-3, which spent most of 1983 in the Earth's magnetotail, and the International Cometary Explorer's encounter of comet Giacobini-Zinner in 1985. Definition studies will be continued during fiscal year 1986 on such missions as the potential cooperative Japanese and European International Solar-Tethered Satellite System and on the chemical release investigations in support to the Combined Chemical Release and Radiation Effects Satellite which is being developed by the DOD.

Earth radiation budget experiment

The Earth Radiation Budget Satellite (ERBS) was successfully launched in 1984, and data continues to be collected from the satellite. The Earth Radiation Budget Experiment (ERBE) instruments which wll be flown on NOAA-G have been completed. NOAA-F was launched December 12, 1984, with a set of ERBE instruments; the NOAA-G launch is scheduled for August 1985. NASA also is continuing to support NOAA by managing the implementation of the NOAA and the Geostationary Operational Environmental Satellites (GOES) series on a reimbursable basis.

Extended mission operations

Fiscal year 1985 funding for Extended Mission Operations is required to support continuing mission operations and data analysis activities for the International Sun-Earth Explorers, the Interplanetary Monitoring Platform and the Dynamics Explorers. Extended operations support of the Active Magnetospheric Particle Tracer Explorer, which was launched in 1984, will be continued in fiscal year 1986. Operation of the Nimbus and Solar Mesophere Explorer SME satellites and processing of the collected data will be continued, as will activities to provide ground truth for a NASA-developed ozone instrument to be flown on a NOAA weather satellite. The SME and Nimbus satellites continue to produce extremely valuable data on ozone concentrations which will be used to estimate the occurrence of natural variations, sea surface temperatures, aerosol measurements, and ocean productivity. Correlative ground truth activities will also be continued in fiscal year 1986; these *in situ* observations are needed to verify the quality of remote observations and to improve our ability to intercept them. In addition, fiscal year 1986 funding is required for operation and data analysis activities associated with the Earth Radiation Budget Satellite, which was launched in 1984.

Scatterometer

Design and development activities were initialed in fiscal year 1985 on the Scatterometer which will be flown on the Navy Remote Ocean System (N-ROSS) in mid-1989 to acquire global ocean data for operational and research usage by both the military and civil sectors.

The Nimbus spacecraft continues to collect unique data which is being used in the study of long-term trends of the Earth's atmosphere, oceans, and polar ice, and provides near real-time data. Collection and analysis of the SME data continues. The Dynamics Explorer continues to collect valuable data on magnetosphere-ionosphere coupling processes. In addition, the ISEE-3 spacecraft, re-

named International Cometary Explorer, has completed an exploration of the Earth's geomagnetic tail and is being redirected toward a planned encounter in 1985 with the comet Giacobini-Zinner.

Upper Atmosphere Research Satellite (UARS) mission

The UARS will place a set of instruments in Earth orbit which will measure the state of the stratosphere, and provide data about the Earth's upper atmosphere in spatial and temporal dimensions which are presently unattainable. Detailed definition studies of the instruments have been completed, and the design and development activities have begun.

The fiscal year 1986 funds are required for continuation of the design and development activities on the UARS instruments leading to the critical design review for approximately one-half of the full instrument complement. In addition, the spacecraft design and development activities will be continued in fiscal year 1986, leading to the observatory preliminary design review in 1986 and the critical design review in early 1987.

NASA will also continue advanced technology development on prospective future missions, for example, TOPEX.

COMMITTEE COMMENT

The Committee authorizes $114 million for the UARS program with the understanding that a $20 million reduction from the administration's budget request of $134 million should not, in and of itself, delay the launch of UARS from its currently scheduled launch date of October 1989. Notwithstanding this reduction the Committee fully supports UARS as our Nation's foremost initiative to gather a global data set of the upper atmosphere.

The Committee's $5 million reduction from the administration's request of $31,700,000 for the Scatterometer is based on the recently revealed 13-month launch slip of the N-ROSS, on which the Scatterometer will fly. The new launch date is September 1990 and the new delivery date for the Scatterometer is January 1989. Also, it is the Committee's understanding that launch slippage has increased NASA's cost for the Scatterometer due to inflation and the requirement to maintain NASA's Scatterometer team for a longer time than originally planned. The Committee expects to be kept informed about any other delays in the Scatterometer program and the N-ROSS program.

The Committee continues to support both the Ocean Topography Experiment (TOPEX) and the International Solar Terrestrial Physics (ISTP) program as important elements in NASA's agenda for Environmental Observations missions. Although NASA is enjoying the international participation of France in the TOPEX program and France and Japan in the ISTP program, NASA also has assumed the responsibility that goes along with the complexities and sensitivities of cooperative programs.

With this in mind, the Committee urges NASA to proceed with TOPEX and ISTP, within available resources, to protect the cooperative nature of both programs. The Committee believes that unless NASA demonstrates that it can be a trusted partner in such coop-

erative efforts, the United States will not be able to enjoy the synergistic and cost-effective elements that so often accompany cooperative programs such as TOPEX and ISTP.

Materials Processing in Space—$34,000,000

The Committee authorization of $34 million for Material Processing in Space for fiscal year 1986 is identical to the Administration's request.

The Material Processing in Space program emphasizes the science and technology of processing materials to understand constraints imposed by gravitational forces and the unique capabilities made possible by controlling these processes in the space environment. Ground-based research, technology development, and payload definition activities in fiscal year 1985 concentrate on six major processing areas: metals and alloys, electronic material, glass and ceramics, biotechonolgy, combustion, and fluid dynamics and transport phenomena. These activities will provide the scientific basis for future space applications of materials processing technology as well as a better understanding of how these processes occur on the ground. Definition studies will be performed for Shuttle experiment candidates in areas such as containerless experiments, combustion science, solidification and crystal growth, and blood storage. Also included are maintenance of capabilities for experimentation in drop tubes, towers, and aircraft. An outreach program, consisting of technical publications, workshops, experiment accommodation studies, and support for Joint Endeavor and Technical Exchange Agreements, are included in this program.

Materials Experiment Operations is a consolidation of ongoing activities which provide a range of experimental capabilities for all scientific and commercial participants in the materials processing program. These include Shuttle middeck experiments, the Material Experiment Assembly and the Materials Science Laboratory, which is carried in the orbiter bay. These capabilities will enable users to develop different experiments in a cost effective manner and allow a better understanding of the technnical risks associated with experiment concepts before attempting to develop more complex hardware. In addition, reflight of investigations on Shuttle/Spacelab missions and the middeck is provided for in Material Experiment Operations.

Committee Comments

Both the administration's proposal to develop a permanently manned space station and the commercial space development initiative tout microgravity research as one of the cornerstones of their respective programs. Yet, the Committee notes with concern that NASA's Microgravity Sciences and Applications Division, or Materials Processing in Space (MPS) program, continues to suffer in a number of ways from too low a priority within the Agency. Although the Committee is pleased that the fiscal year 1986 budget request for MPS is increased by 25 percent above the fiscal year 1985 appropriation, it is clear that, compared to our counterparts in the Soviet Union, the ESA, and Japan, NASA's investment in this area of research is well below a competitive level of funding.

Therefore, the Committee authorizes the administration's request of $34 million for Materials Processing in Space as an expression of the Committee's high regard for this critically important area of research.

The Committee also notes that the flight opportunities for microgravity experiments have fallen far short of the demand and need. For example, NASA's removal of Materials Science Laboratory (MSL–1), the first Spacelab dedicated to microgravity research, from the Shuttle manifest, is one indication of the low priority of MPS activities within NASA. Only if NASA demonstrates a commitment to these flight opportunities will laboratories and investigators across te Nation make the initial investment that is required for this type of research. Accordingly, the Committee urges NASA to accommodate on other MSL missions, to the greatest extent possible, the experiments that were previously scheduled for MSL–1.

The Committee also is aware that NASA is considering the implementation of a policy which would assign a higher priority of NASA's Shuttle payloads which have been delayed more than 6 months. Although the Committee understands the difficulties associated with scheduling payloads on the Shuttle, the Committee nonetheless believes that only by flying more microgravity experiments on a timely basis can we develop the data base that is critical to the best use of the space station and to the advancement of commercial space activities such as space manufacturing. Therefore, the Committee urges NASA to give special consideration to implementing this policy to avoid any further congestion in the experiments awaiting a Shuttle flight and to develop this fundamentally important data base.

The Committee recognizes the growing interest in the field of microgravity sciences and notes that several new Joint Endeavor Agreement related to MPS activities have been signed over the past year. This growing interest also is reflected in the expanding number of new MPS proposals that NASA has received over the past year. However, due to an insufficient level of funding, NASA's flexibility to analyze and assess these proposals has been limited. Recognizing the significance of microgravity experiments to the future utility of the space station and to commercial space activities in general, the Committee urges NASA to give the Materials Processing in Space program the funding and consideration that is commensurate with that program's role in the development of these two initiatives. Only then can we as a Nation move beyond the rhetoric and onto the threshold of the vast number of opportunities associated with space utilization.

COMMUNICATIONS—$96,200,000

The Committee authorizes $96,200,000 for fiscal year 1986 in lieu of the administration's request of $106,200,000, and specifically authorizes $80 million for the Advanced Communications Technology Satellite (ACTS) program.

Summary of funding levels, fiscal year 1986

Advanced Communications Technology Satellite	$80,000,000

Research and Analaysis	10,600,000
Search and Rescue	1,300,000
Technical Consultation and Support Studies	3,100,000
Experiment Coordination and Operations Support	1,200,000
Total	$96,200,000

Advanced Communications Technology Satellite

The objective of NASA's ACTS flight-test program is to prove the feasibility of certain advanced communications technologies through a flight test program.

The specific technologies to be validated include: (1) the use of multiple fixed and scanning spot antenna beams; (2) frequency reuse; (3) beam interconnectivity at both intermediate frequencies and at baseband; (4) advanced system network concepts; and (5) dynamic rain-compensation techniques. These technologies will apply to a wide range of communications systems in the 1990's. NASA signed a contract in August 1984 with RCA to develop the flight and ground hardware leading to a 1989 launch. TRW, Comsat, Motorola, Electromagnetic Sciences, Hughes, and other manufacturers are major subcontractors.

The ACTS spacecraft will be launched from the Shuttle into geostationary orbit.The spacecraft will consist of a commercial communications bus and a multibeam communications package, including a multibeam antenna, baseband processor, RF matrix switch, traveling wave tube amplifier, and low noise receiver. The ground segment will consist of a NASA ground station and a master control station. Following launch and checkout, a 2-year program of user-funded experiments will be initiated during which time ACTS system technologies will be tested, evaluated, and validated. Over 40 organizations, including DOD, have requested consideration for experiment opportunities on ACTS to date.

Research and analysis

The Communications Research and Analysis program continues to provide development of component and device technology required by NASA, other government agencies, and U.S. industry for advanced communications satellite systems. Big payoff items leading to greater spectrum and bandwidth efficiency are being pursued. In addition, in fiscal year 1985, the Mobile Satellite activities will continue to address the development of critical enabling technologies needed to insure growth of a commercial mobile satellite service.

The mobile communications technologies activity is aimed at accelerating the introduction of a commercial mobile satellite service in the United States at developing ground segment technology which is more efficient in its use of power, bandwidth, and orbital slots and at developing networking techniques needed to insure its growth. The Mobile Satellite, which has been formally coordinated with Canada, is expected to be implemented through a Joint Endeavor Agreement as follows: a U.S. system operator, who would procure, own, and operate the satellite, would supply a small percentage of the satellite channel capacity to NASA for use in terminal hardware validation and in carrying out other government experiments. The operator would use the additional channel capacity

to develop commercial markets. In exchange, NASA would provide standard launch services.

Search and rescue

The Search and Rescue program is an international cooperative program that demonstrates the use of satellite technology to detect and locate aircraft or vessels in distress. The United States, Canada, France, and the Soviet Union developed the system in which Norway, the United Kingdom, and Sweden also participate. Three COSPAS satellites are currently in operation and NOAA-F was successfully launched on December 12, 1984. Over 350 lives have been saved in numerous incidents worldwide and the list continues to grow on a weekly basis. During fiscal year 1984, the demonstration and evalulation phase of the program was officially completed, and a new agreement was signed to continue operation of the system.

Technical consultation and support program

The technical consultation and support program will continue to provide for studies of radio interference, propagation, and special systems required for the growth of existing satellite services and the extension of new satellite applications. Support to the Department of State, the Federal Communications Commission, the National Telecommunications and Information Administration, and the Federal Emergency Management Agency in the development of frequency and orbit sharing techniques and strategies for upcoming World Administrative Radio Conferences will continue.

Experiment coordination and operations program

The experiment coordination and operations support program assists other Federal agencies and public sector organizations in the development of experimental satellite communications for emergency, disaster, and public service applications. Operations of the Applications Technology Satellites (ATS)–1 and –3 are continuing through contracts with the Universities of Hawaii and Miami, respectively.

More than 20 organizations are currently using the ATS–1 and ATS–3 satellites for communication experiments. ATS–3 is supporting emergency medical experiments conducted in conjunction with the Southern Regional Medical Consortium (SRMC). The SRMC experiments determine the value and cost effectiveness of mobile communications via satellite for emergency notification, vehicle dispatch and two-way voice and biomedical telemetry between paramedics and hospital physicians. Efforts toward rural, wilderness, and offshore oil rig applications are emphasized. Similarly, in the Pacific Basin, ATS–1 connects 22 islands and provides disaster relief, medical, educational, and emergency service. This satellite service has been a valuable asset to Pacific users who, prior to ATS–1, received their news 24 hours after the fact.

NASA will continue to maintain approval and policy control of the ATS program. NASA fiscal year 1986 activities will include continued planning for educational and public service communications; the development of low cost ground terminals for the mobile satellite program; continuing support for the management and op-

eration of the Denver Satellite Access Facility; and continuing support for ATS experimenters.

Committee Comments

The Committee continues to believe that NASA has a significant role in advanced communications satellite research and development and that the ACTS program is a logical and critical program through which NASA can support this national requirement.

In the fiscal year 1985 NASA authorization (Public Law 98-361, section 101), the Committee directed NASA to conduct a flight test of ACTS no later than 1989, and that remains the Committee's position. The Committee understands that the $10 million reduction assumed in the fiscal year 1986 NASA authorization still enables a 1989 flight test of ACTS, which should assist in reaffirming our Nation's competitive position in the world communications satellite market.

The Committee also is aware of NASA's intent to shut down the ATS-1, effective August 1, 1985. The loss of this Pacific Basin-New Zealand-Australia Communications Network will seriously affect important professional networks that have been established over long periods of time. With this in mind, the Committee requests that NASA find another option to take the place of ATS-1 in the Pacific Basin as soon as reasonably possible, and report back to the Committee on its efforts within 6 months.

Information Systems—$16,200,000

The Committee authorization for fiscal year 1986 is $16,200,000, $3 million below the administration's request. The Committee expects this $3 million reduction to be applied without prejudice to the Information Systems programs.

The objectives of the Information Systems programs are to develop and demonstrate advanced capabilities for managing, distributing, and processing data and information; to implement information systems standards and provide common software to lower data systems costs; and to develop the basis for data services to provide improved access to, and rapid delivery of, space data and advanced data systems in support of the Nation's satellite programs and the space science and applications projects.

This program provides for timely development of data systems capabilities to meet the needs of flight missions and major space science and applications programs. The early demonstration of capabilities has a high potential for reducing ground data systems development risks and the chance of late data delivery.

Commercial Programs

The Committee authorizes, as follows, $26 million for Commercial Programs, $15,100,000 below the administration's budget request.

Summary of funding levels for fiscal year 1986

Technology Utilization	$9,500,000

Commercial Use of Space	$16,500,000
Total	26,000,000

Technology Utilization—$9,500,000

The NASA Technology Utilization program is designed to enhance national economic growth and productivity through the transfer of new technology resulting from NASA research and development programs to the nonaerospace sectors of the economy. This program has generated use of aerospace technology in U.S. industry, and, in addition, technological advances have found use in important public sector areas such as medicine, transportation, environment, and public safety. The objectives of the program are: (1) to accelerate and facilitate the application and use of new technology, and thus shorten the time between development of advanced aeronautics and space technologies and their infusion into the economy; (2) to encourage multiple secondary uses of NASA technology in industry, education, and government where a wide spectrum of technological problems and needs exists; and (3) to understand more fully the technology transfer process and its effect on the economy, and to develop applications of NASA's aerospace expertises—its technology, technologists and unique facilities—to important non-aerospace needs of the Nation.

Commercial Use of Space—$16,500,000

The objective of the Commercial Use of Space program is to increase private sector awareness of space opportunities and to encourage increased industry investment and participation in high technology, space-based research and development. Expansion of the level of private sector investment in commercial space activities will help the United States retain its leadership in science and technology and will accrue associated benefits to our Nation. The program will be built on Shuttle and related space-based operational capabilities. The program is responsive to the President's National Space Strategy and National Policy on the Commercial Use of Space, both of which direct NASA to expand private sector investment and involvement in space activities. The fiscal year 1985 House and Senate Authorization Conference report directed that NASA propose a new line item for this activity in the fiscal year 1986 budget request.

Fiscal year 1985 activities include implementing the National Policy on the Commercial Use of Space, establishing an organizational focal point for commercial programs at NASA, and initiating efforts to foster commercial use of and access to space. These efforts include additional Centers for Commercial Development of Space, increased accessibility to NASA facilities and equipment, especially in space, small focused research efforts on processes having commercial potential, and the incorporation of other functions designed to facilitate private sector use of space for commercial ventures. Fiscal year 1986 activities will provide a continuation and some enhancement of the fiscal year 1985 program initiatives. These efforts are designed to encourage significant private investment in commercial enterprises that take advantage of the unique

characteristics of space, such as vacuum, microgravity, and radiation.

Committee Comments

The Committee authorizes $16,500,000 for the Commercial Use of Space Program in fiscal year 1986. This reduction of $13,500,000 million for the administration's fiscal year 1986 budget request of $30 million does not reflect any lessening of support by the Committee for the Commercial Use of Space program. The Committee advocates the general and specific objectives of this program and believes that the program provides the linkage between the private sector and the Federal Government required to stimulate commercial space activities. Providing the university community and private sector greater access to Federal ongoing research and facilities and promoting interaction between public and private researchers should do much to stimulate the U.S. economy and to enhance the U.S. technological leadership in space.

Unfortunately, the severe fiscal constraints that exist in this year's budget preclude the Committee from providing as rapid a rate of growth in the Commercial Space program as assumed in last year's authorization. The Committee hopes the fiscal year 1987 Budget will provide more flexibility.

The Committee notes that commercial and university interest in space activity is growing and that aerospace and non-aerospace firms alike are becoming increasingly intrigued by the opportunities that are likely to ensue from the commercial development of space. This is evidenced by the number of Joint Endeavor Agreements and Technical Exchange Agreements that have been established during the past year between NASA and the private sector.

Furthermore, the Committee is encouraged by the interest shown by the business and academic communities in NASA's proposed Centers for the Commercial Development of Space. NASA is encouraged to maximize, within the available resources in fiscal year 1986, the opportunities related to these Centers so as to further enhance private sector investment and involvement in commercial space activities.

Aeronautical Research and Technology

The Committee authorizes $350,400,000 for fiscal year 1986, $3,600,000 below the administration's request. This reduction reflects the elimination from Research and Technology (R&T) Base of $4 million planned for- activities related to the Altitude Wind Tunnel at Lewis Research Center and the addition of $400,000 for Rotorcraft R&T Base activities.

Summary of funding levels, fiscal year 1986

Research and Technology Base	$235,700,000
Systems Technology Programs	114,700,000
Rotorcraft Systems Technology	(20,500,000)
High-Performance Aircraft Systems Technology	(21,800,000)
Subsonic Aircraft Systems Technology	(0)
Advanced Propulsion Systems Technology	(44,200,000)

Numerical Aerodynamic Simulation	(28,200,000)
Total	350,400,000

The objective of the Aeronautical Research and Technology program is to conduct an effective and productive program that contributes materially to the enduring preeminence of U.S. civil and military aviation by: (1) conducting appropriate levels of disciplinary and systems research at the leading edge of technology in those areas critical to the continued superiority of U.S. aircraft; (2) maintaining the research centers in positions of excellence in facilities and technical staff; (3) assuring timely transfer of research results to the U.S. aeronautical industry; (4) assuring appropriate involvement of universities and industry; and (5) providing on a reimbursable basis aeronautical development support to other government agencies and U.S. industry.

Conducted well in advance of and independent of specific applications, the Aeronautical Research and Technology program includes both fundamental research in the aeronautical disciplines and systems research directed at interaction among disciplines, components, and subsystems applicable to general classes of advanced aircraft. The program involves participation by aeronautical manufacturers from the industrial base essential to both military and civil aviation to ensure that the technology is compatible with practical design considerations and can be successfully transferred into application.

The Research and Technology Base program includes disciplinary research which is both broadly applicable to all classes of aircraft (such as general aviation, transports, rotorcraft, and hypersonic and other high-performance aircraft), as well as the disciplinary research which is unique to any of these classes of aircraft. Funding for the technical operation of wind tunnels, propulsion facilities, computional facilities, simulators, and flight research operations is covered in the most appropriate disciplinary elements of the research and technology base. The increased research and technology base funding will support, in addition to inflation, the operation of the national transonic facility, which will be in the first year of operational status, as well as the operating costs for the numerical aerodynamic simulator.

The Systems Technology Programs are designed to extend the scientific discoveries and findings flowing from the R&T Base through applied research to demonstration and validation for selective technologies which thereafter provide the design phase for advanced military and commercial products undertaken by private industry.

Rotorcraft systems technology

The rotorcraft systems technology program conducts research on two fronts. The first thrust consists of efforts in broad systems technology areas that advance the state-of-the-art in flight dynamics and controls. The second thrust involves advanced concepts which are investigated in conjunction with DOD and the Federal Aviation Administration. These currently include the X-wing rotor demonstration test on the Rotor Systems Research Aircraft (RSRA) and XV-15 tilt rotor flight testing. In both of these thrusts, inte-

grated system testing is required and involves large-scale wind tunnel testing, flight testing, and moving-base simulation.

In full-scale testing, preparations continue for the startup of the 40×80-foot wind tunnel in early 1986. A tail rotor was thoroughly documented for loads and acoustics on the outdoor aerodynamics research facility for a fiscal year 1986 main rotor/tail rotor interference test in the 40×80-foot wind tunnel. The main rotor rig for that test was shake tested and load cells were calibrated.

Under the joint DARPA/NASA RSRA/X-wing Program, the prime objective is to perform an x-wing rotor conversion from rotary to stopped-rotor flight and return to rotary wing flight. It will also investigate through flight research the dynamic stability, performance, and rotor control characteristics of the X-wing rotor system. In 1985, the final modification to the RSRA will be completed. The fabrication of the X-wing rotor system will also be completed and installed on the aircraft.

The X-wing rotor program will be generating ground-based, piloted simulation, propulsion system testbed data and vehicle management systems data in support of the flight investigation of the X-wing rotor on the RSRA. In particular, the flight testing will culminate in the historic demonstration of conversion from rotary to stopped-rotor to rotary flight.

Supporting the Navy joint services advanced vertical lift (JVX) program, XV-15 tilt rotor flight testing continued. A side arm controller was evaluated. New steel hubs were installed, enabling high gross weights and more demanding maneuvers to be evaluated. The advanced technology blades (ATB) were installed on the aircraft, and a limited evaluation begun. In ground-based testing, reports on the very successful hover tests of the XV-15, JVX, and ATB rotors were issued. Preparation began for a 40×80-foot wind tunnel test. Using point support by the Navy, NASA, and the Army, it will be possible to complete flight evaluation of the ATB rotor and perform military suitability tests. Wind tunnel and simulation tests will also be supported for JVX.

High Performance Aircraft Systems Technology

The objective of the High Performance Aircraft Systems Technology program is to generate validated engineering methods and design data applicable to the development of advanced high-performance, high-speed aircraft for military and civil applications. The programs objectives are accomplished by analysis, ground-base simulations, wind tunnel experimental research, and flight research tests of aircraft.

The flight research activity in fiscal year 1986 will involve a variety of high-performance aircraft to investigate advanced concepts. Several projects will continue their flight test phases during this period. Under the joint NASA/Air Force Advanced Fighter Technology Integration projects, the F-16 aircraft will complete its flight program, and the F-111 mission adaptive wing will continue the research program with evaluation of the automatic mode for in-flight adjustment of wing camber. The F-15 HIDEC will continue flight research to evaluate the potential of improving performance and mission effectiveness due to engine-airframe control integration. The joint NASA/DARPA X-29A forward-swept wing air-

craft will complete the baseline flight program and begin the flight research phase to exploit fully the technologies designed into the aircraft.

The F–18 high angle-of-attack aircraft will start the flight research program with focus on aerodynamics and control system design for aircraft operations at high angles of attack. Vortex flap technology will be evaluated to determine if a flight research program using a NASA F–106 aircraft should be initiated in fiscal year 1986.

The fiscal year 1986 funding level reflects the start of the final design and construction phase of the oblique wing research aircraft. A single contractor will be selected from those participating in the preliminary design contracts during fiscal year 1985. The NASA F–8 digital fly-by-wire test aircraft will be converted to the research testbed for the flight program. This aircraft provides for easy installation of the oblique wing, a well defined, readily modifiable, highly flexible, digital flight control system.

During fiscal year 1986, the HOST program will continue to concentrate on developing improvements in high-temperature instrumentation, predictive methods for structural analysis, aerothermomechanical environment and life. Research will be conducted using the newly developedd high-temperature structures laboratory at Lewis Research Center to study the behavior of turbine blade material and actual burner liner hardware under realistic, complex aerothermomechanical loading conditions. Work will continue on the development of specialized structural analysis codes designed to predict the detailed turbine engine component stress-strain response over an entire mission. Life prediction methodology will be extended to anistotropic superalloys. Ceramics research will focus on identifying critical processing variables affecting reliability, development of methodology for measuring crack growth, and nondestructive evaluation techniques for monitoring small flaws.

Subsonic aircraft systems technology

The objective of the subsonic aircraft systems technology programs is to provide a substantiated base of key technologies, design data, and validated design procedures. Individual concepts are examined in the systems context with other interacting components and technologies to define techniques and procedures for obtaining maximum benefit from these applications. To this end, the advanced composite structures technology program was designed to develop a composite primary airframe structures technology base that achieves the full potential of weight, fuel, and cost savings possible for the design of civil and military transport aircraft in the 1990's. However, due to budgetary constraints, NASA has proposed terminating this program at the end of fiscal year 1985.

Advanced Propulsion Systems Technology

The objective of the Advanced Propulsion Systems Technology program is to explore and exploit advanced concepts for future aircraft engines in high-payoff technology areas through the focusing of fundamental research and technology efforts and integration of advanced propulsion components.

Activities in the Advanced Turboprop Systems program are focused on development of a broad research and technology data base and systems integration activities in preparation for flight verification which is necessary to establish large-scale advanced turboprop feasibility. The design of the large-scale advanced propeller (LAP) was completed by Hamilton Standard, and the fabrication of the 9-foot-diameter unit is underway, along with the fabrication of a 2-foot-diameter aeroelastic model to evaluate the aeroelastic scalability of the 9-foot LAP. Lockheed-Georgia has been selected as the prime contractor for the propeller test assessment (PTA) and is now progressing toward the key flight evaluation of the LAP in fiscal year 1987.

A contract has also been awarded to General Electric Company for a ground test of a gearless counter-rotation propfan concept. Model tests in the 2-foot-diameter size are verifying the counter-rotation propeller performance and acoustics predictions, and fabrication for the ground test vehicle is well underway with test initiation planned for June, 1985. Evaluation of 2-foot-diameter geared counter-rotation models is also underway with good results at Hamilton Standard, and contracts were signed with Pratt & Whitney and Allison Gas Turbine to evaluate and verify technology for large-scale gearboxes.

Wind tunnel aerodynamic, acoustic, and stability and control investigations were conducted for aft-mounted single- and counter-rotation turboprops. It was determined that the source noise directivity patterns are different for single- and counter-rotation propellers and that normal forces generated by the propellers at takeoff conditions are greater for counter-rotation than single-rotation configurations.

In fiscal year 1986, advanced turboprop systems program activities will consist of continued development of the broad-based supporting technology and preparation for the flight evaluation of the large-scale advanced propeller. Analysis and testing of the low- and high-speed propeller/inlet/diffuser testing will be completed. Three LAP rotors will be delivered to the propeller test assessment program and evaluated at static conditions with a modified gearbox and engine, as well as tested at low-speed conditions for performance, structural integrity, and cabin acoustics in the Ames Research Center's 40x80-foot wind tunnel.

Wind tunnel tests of a one-ninth scale model of the PTA aircraft will also be accomplished to determine the flying qualities of the airframe/turboprop combination. Evaluation of the gearless counter-rotation concept will be concluded. High-speed wind tunnel investigations will be continued for wing- and aft-mounted single- and counter-rotation configurations for stability and control evaluation, as well as code verification. Acoustics efforts will include counter-rotation source noise prediction modeling, cabin acoustics investigations, and experimental evaluation of counter-rotation propeller configurations.

Contracted studies to evaluate the suitability of advanced turboprop technology for application to multipurpose subsonic naval aircraft, general aviation aircraft, and military tactical transports will be completed. Test and analysis of acoustics and performance results will be completed on the unique, high-radius-ratio, counter-ro-

tating, gearless model propulsion system. The full size, first build of this system will be completed, and ground testing will begin.

The general aviation/commuter engine technology effort will continue to focus on the development of a fundamental understanding and analytical data base for flow phenomena and heat transfer in small gas turbine engine components.

Numerical Aerodynamic Simulation

The objective of the Numerical Aerodynamic Simulation (NAS) program is to augment the Nation's capabilities in computational fluid dynamics and other areas of computational physics by developing a preeminent capability for numerical simulation of aerodynamic flows. This program will provide the computational capabilities required to solve problems which are currently intractable.

NASA began major hardware procurements for the NAS in fiscal year 1984, leading toward assembly of the initial operating configuration during fiscal year 1985. Full-scale development of the NAS network hardware begins with the delivery of the integrated support processor complex (front-end computers and supporting equipment) in early fiscal year 1985. The first high-speed processor, a Cray 2 supercomputer, will be delivered late in fiscal year 1985 and will be integrated into the NAS network. Extensive hardware and software test and integration activities will follow. During fiscal year 1985, construction will begin for the NAS facility.

The first part of fiscal year 1986 will be an intense test and integration period leading to operational status of the NAS IOC during the third quarter of fiscal year 1986. System software development will continue for all components of the NAS network leading toward an operational readiness review for the NAS IOC in the third quarter of fiscal year 1986. During fiscal year 1986, procurment of hardware and software for the NAS extended operating configuration will begin. RD 13-49 components in the extended operating configuration are the high-speed processor number two, the expanded graphics subsystem, and the expanded long-haul communications subsystem.

The successful operation of the initial NAS configuration in fiscal year 1986 will not only provide the world's premier computational capability for NASA and the Nation, but will also provide the critical networking capabilities required to support the expanded NAS extended operating configuration which will reach operational status in early fiscal year 1989.

Committee Comments

During the past year, aeronautical industry events have raised questions regarding the need for the scheduled flight test of NASA's LAP/PTA Advanced Turboprop program. The Committee recognizes that, while an industry flight test of a specific advanced turboprop configuration will provide a discrete set of data, it is still important to develop the generic data profile for the remaining critical technology issues of structural integrity and acoustics.

Because these technology issues cannot be adequately tested in small-scale model testing, the Committee believes that a full-scale flight test as previously planned for the Advanced Turpoprop

(ATP) program is still a valid and necessary objective. The Committee authorizes the administration's request of $42 for the ATP program, and consistent with the Committee's fiscal year 1985 authorization, continues to expect this program's flight test by 1987. This should allow the test data to be available soon enough to enhance our Nation's competitive position in the world aviation market in the early 1990's.

The Committee authorization also reflects a $4 million reduction from the Administration's $4 million request for the Altitude Wind Tunnel. Based on testimony presented to the Committee, this proposal Lewis Research Center facility would provide only a modest increase in capabilities over existing wind tunnels, and the estimated development cost and annual operating costs could not be justified by the slight increase in capabilities.

The Committee authorization also includes an additional authorization of $.4 million for Rotorcraft R&T Base activities.

Space Research and Technology—$154,000,000

The Committee authorizes $154.0 million for Space Research and Technology, $14 million below the administration's request of $168 million. The Committee expects this reduction to be applied without prejudice.

The overall goal of the space research and technology program is to advance the technology base in support of NASA's role as an effective, productive, and long-term contributor to the continued preeminence of the United States in space. The specific objectives of this program are: (1) to support a broad-based advanced technology program designed to provide new concepts, materials, components, devices, software, and subsystems for use in United States civil and military space activities; (2) to assure preeminent national capability through extensive and interrelated participation in the program by the NASA centers, other government agencies, universities, and industrial research and technology organizations; and (3) to support a strong institutional base to maintain NASA centers in positions of recognized excellence in critical space technologies.

The fiscal year 1985 program supports these objectives by emphasing disciplinary technologies that provide the necessary data base and understanding to create new opportunities for future national civil, military, and commercial space mission objectives, and on systems technology programs directed at obtaining fundamental data from in-space experimentation, and transferring advanced technology into space programs through more focused efforts that provide proof of concept to support technology readiness for anticipated applications.

Tracking and Data Advanced Systems—$14,800,000

The Committee authorizes $14,800,000 for Tracking and Data Advanced Systems, $1,400,000 below the Administration's request of $16,200,000.

The overall objective of the Advanced Systems program is to perform studies and to develop tracking and data systems and techniques required: (1) to obtain new and improved tracking and data capabilities that will meet the needs of approved new missions and

near term new starts; and (2) to improve the cost effectiveness and reliability needed for overall support of the total mix of spaceflight missions.

This program remains a vital element in the Space Tracking and Data Systems program. Activity continues under this program to assess the dramatic changes taking place in the state-of-the-art in telecommunications, electronic micro-circuitry, and computer technology. This effort is critical for proper planning and for the application of new technology to future support capabilities that are cost effective and reliable. Efforts include the investigation of upcoming missions and studies of ground systems and telecommunications links to determine design approaches and overall trade-offs for the lowest life-cycle costs to support future space missions.

Space Flight, Control, and Data Communication—$3,386,900,000

Shuttle Production and Operational Capability—$941,500,000

The Committee authorizes $941,500,000 for fiscal year 1986, $35 million below the administration's request. This reduction is achieved by authorizing $110 million for Shuttle structural spares, $10 million below the administration's request, and by eliminating the administration's $25 million request for Changes and Systems Upgrading.

The Space Shuttle is the key element of a versatile STS that is available to a wide variety of national and international users. The Space Shuttle is the first reusable space vehicle and is configured to carry many different types of space applications, scientific, and national security payloads. The Space Shuttle offers unique capabilities that cannot be achieved with today's expendable launch vehicles—to retrieve payloads from orbit for reuse; to service and repair satellites in space; to transport to orbit, operate, and return space laboratories; to transport materials and equipment to orbit; and to perform rescue missions.

Shuttle production and operational capability development provides for the national fleet of Space Shuttle orbiters, including main engines, and provides for the launch site facilities, initial spares, production tooling, and related supporting activities to meet the needs of NASA, the DOD, and other domestic and international users of space. More specifically, this line item contains the orbiter production for three flight orbiters; the full mofidication of Columbia (OV-102) to its operational configuration; the procurement of major structural orbiter components to be used as spares for the operational orbiter fleet; the residual development tasks for the orbiter, main engine, external tank and solid rocket booster (SRB); JSC mission support capability development; the equipment provisioning of the facilities for launch and landing at the KSC; the development of the filament wound case solid rocket booster; the initial lay-in of spares and the ground support equipment; and the rate tooling for the external tank and SRB. Modifications of two orbiters, two mobile launch platforms, and both launch pads for the conduct of the planetary missions (Galileo and Ulysses) in 1986 are also funded under this budget item.

Orbiter

The continuation of the orbiter production has been a major activity during the past year. The planned four-orbiter fleet includes: Columbia (OV-102), the orbiter vehicle developed and flown on the four test and evaluation flights; Challenger (OV-099), the second flight orbiter, which was fabricated using elements of the structural test article; and two orbiters—Discovery (OV-103) and Atlantis (OV-104)—of a lighter-weight configuration. OV-103 was delivered in November, 1983. OV-104 was delivered in April, 1985. The final phase of operational modifications for OV-102 will be complete in fiscal year 1985. Work began in fiscal year 1982 on modifications to orbiters and the related systems integration analyses for the use of the Centaur and its payloads. The provisioning of orbiter spares is an on-going activity to support the requirements for the initial lay-in of line replaceable units of equipment at the launch site. In addition, the budget provides for the extensive acquisition of orbiter structural spares to support the four-orbiter fleet.

At KSC the second line of vehicle processing stations is being phased in to support the parallel launch processing of orbiters. Parallel processing can be done in the Orbiter Processing Facility (OPF) and Vehicle Assembly Building. Parallel processing at the launch pad will be possible after Pad B completion in January 1985, consistent with the requirements to support the Centaur launches of Galileo and Ulysses in May 1986. The third mobile launch platform (MLP) is planned for a September 1986 operational readiness date.

Launch and mission support

Launch and Mission Support provides for the second set of processing stations at KSC to support parallel orbiter processing; the additional astronaut training, mission preparation, and mission operation capabilities required for higher flight rates; the modifications to the launch sites to accommodate the new Centaur upper stage; and studies of program-level improvements for the operations and management of the STS.

The first line of facilities at KSC activated during Design, Development, Test, and Engineering/Evaluation supports the launch processing and evaluation of an orbiter vehicle from landing through launch. The second line of processing stations is being phased in to support parallel launch processing of more than one orbiter through the various work areas. The second high bay of the OPF and the second MLP were activated in late fiscal year 1982 to support parallel processing of OV-102 and OV-099. The second set of high bays in the Vehicle Assembly Building, the software production facility, and the second control room were activated in fiscal year 1983 to enable parallel processing through orbiter external tank mate. A solid rocket booster processing and storage facility was activated in fiscal year 1984 to facilitate SRB handling, including off-loading of segments from rail cars, segment rotation capability, storage capability for two flight sets (16 segments), and the assembly of SRB aft segments. When Pad B is activated in fiscal year 1986, parallel processing will be possible from the start of OPF flow through launch. A third MLP will be activated in late

fiscal year 1986 to help meet the flight rate scheduled in 1987 and beyond. Facility modifications supporting the fiscal year 1986 Centaur launches are in process.

Propulsion systems

Initial certification of the Space Shuttle main engine at a full power level was completed in fiscal year 1983. During the course of that certification, it became apparent that the main engine configuration required additional design modifications to achieve an acceptable level of reliability and maintainability. The modifications focus on the high pressure pumps and the hot gas manifold. Development of the pump modification was essentially completed in fiscal year 1984 and the new pumps began certification at the full power level thrust level early in the second quarter of fiscal year 1985. The redesign of the hot gas manifold is complete and the changes will be available for test in fiscal year 1986.

A major replanning of the main engine program was completed last year. As a result, NASA began a study of engine improvement which involves alternative rocket engine contractors and a technology engine effort at the MSFC. During the past year, six flights of the Space Shuttle (up to and including Mission 41–D) were completed with no main engine anomalies affecting flight performance.

The experience with the SRB's during earlier flights indicated the need for design improvements to reduce the amount of water impact damage to the SRB aft skirt, and to the hydraulic power units mounted internally to the aft skirt. Design improvements implemented to date have proven to be successful in reducing structural damage. Problems still exist with water intrusion damage to the thrust vector control servo actuators. Modifications are being implemented to the thrust vector control system to eliminate this problem. To reduce the water impact velocity, which is the major contributor to the damage at water impact, larger main parachutes were developed and used successfully on STS 41–F and STS 51–A and will continue to be used on subsequent flights.

The first high performance SRB motor was successfully flown on STS–8. The performance characteristics of the motor were well within specifications and achieved design goals. Post-flight inspection of the motor indicated more than desirable erosion. As a result, some minor changes to the manufacturing process for the carbon phenolic nozzle material may be necessary. Efforts are underway to correct this design margin problem.

The SRB program includes the development of an FWC motor case. This will enable NASA to replace the heavier steel motor case segments for high performance launches. The performance increase is achieved by reducing the Shuttle lift-off weight resulting in a payload capability improvement of approximately 4600 pounds. The full scale development hydrotests were completed, the first static test firing (DM–6) was successfully conducted, structural test articles have been delivered to MSFC for dynamic load tests, and all segments to support the first flight from Vandenberg Launch and Landing Site have been wound.

Performance of the eternal tank on all 16 Shuttle flights has been excellent. The Vandenberg Launch Site received its first flight tank in October 1984. All flight hardware has been delivered

on or ahead of schedule. Weight savings on the lightweight tanks have been greater than those in the baseline and should continue to be realized as additional planned improvements are implemented. Cost reduction and production readiness continue to be a high priority, as NASA introduces additional tooling and equipment to meet production requirements of 24 tanks per year.

Changes and Systems Upgrading

Changes and Systems Upgrading provides funding for potential changes and system modifications as well as unanticipated new requirements not covered in the budget estimates for the above activities and other program elements.

COMMITTEE COMMENTS

The Committee authorization for Shuttle Production and Operational Capability reflects a reduction of $10 million from the $120 million requested by the administration for orbiter structural spares. The Committee understands that the remaining $110 million will be sufficient to ensure the scheduled delivery of the structural spares as well as to maintain critical prime contractor skills. This reduction should not be interpreted as a lessening of the Committee's support for NASA's structural spares program or for the fifth orbiter. The Committee continues to support this program as a necessary and integral element of our Nation's STS. Severe fiscal limitations in the fiscal year 1986 budget, however, require that all programmatic activities bear part of the budget reduction effort.

At this time, future Shuttle requirements and the need for the fifth orbiter are uncertain. Space commercialization, the deployment and operation of the space station, the Strategic Defense Initiative, and other potential DOD requirements each represent future initiatives which, separately or collectively, could create a real and identifiable need for a fifth orbiter. The Committee is hopeful that over the next six months NASA will be able to identify this need if, in fact, it exists. Furthermore, the Committee encourages NASA to incorporate within the fiscal year 1987 budget request any decision to build a fifth orbiter, should the Agency identify this requirement.

The Committee also recommends a $25 million reduction from the administration's request of $25 million for Changes and Systems Upgrading. With the delivery of the orbiter Atlantis in April, 1985, activities related to the development of the Shuttle may be deemphasized without any degradation of the capabilities of the STS.

The Committee also notes with concern the brake failures associated with Shuttle mission 51-D, especially in light of the attention that NASA's Aerospace Safety Advisory Panel has given to the Shuttle landing gear over the past 2 years. The Committee expects to be kept informed of NASA's response to this landing gear failure and encourages NASA to reexamine the landing gear recommendations of the Aerospace Safety Advisory Panel.

Space Transportation Operations—$1,700,100,000

The Committee authorizes $1,700,100,000 for fiscal year 1986, $25 million less than the administration request.

Space Transportation Operations provides the standard operation support services for the primary U.S. space launch system: the Space Shuttle. Within Shuttle Operations, flight hardware is produced, refurbished and repaired, and manpower, propellants, and other materials are furnished to conduct and support both flight and ground operations. The Space Shuttle operations program provides for the launch of NASA missions and, on a reimbursable basis, DOD, other U.S. Government, commercial, and international missions. The launch schedule calls for 9 flights in fiscal year 1985 and 15 flights, including the first launch from the West Coast, in fiscal year 1986, and a planned 17 flights in fiscal year 1987. The flight rate is planned to reach 24 launches per year by 1989.

The Space Shuttle provides launch services to non-NASA users on a reimbursable basis, as determined by the greater of each payload's length or weight. For flights launched during the first pricing phase (through fiscal year 1985), standard commercial launch services are priced at $18,300,000,00 (75$) with a $4,300,000 (RY$) use charge. Launches in this phase are priced at $16 million (75$). Launches occurring in the second pricing phase (fiscal year 1986 through fiscal year 1988) are priced at $71 million (82$) for commercial launches and $55,500,000 (82$) for DOD launches. The Bureau of Labor Statistics' indices are used to convert base year pricing (75$ and 82$) to real year dollars for billing purposes.

The Shuttle operations budget request funds three principal areas: flight operations, flight hardware, and launch and landing operations. Flight operations consists of mission support, integration, and support. The flight hardware program provides for the procurement of the external tanks, solid rocket motors, booster hardware, and propellants; spare components for the main engines orbiter spares; external tanks disconnect and SRB rate gyros sustaining engineering and logistics support for external tank/solid rocket booster/main engine flight hardware elements; and maintenance and operation of flight crew equipment. Launch and landing operations provides for the launch and landing operations of the Space Shuttle and its cargo.

At KSC, four operational flights were processed and launched in fiscal year 1984. The first two flights included vehicles which were stacked, processed and launched during the Shuttle Processing Contract (SPC) transition, a 6-month period when the incumbent contractors and the SPC (Lockheed) worked together toward a March, 1984 turnover. The full transition was completed on schedule after the successful launch of STS 41-B. The remaining two flights were processed by the SPC and included STS 41-D, the maiden voyage of Discovery. KSC planning includes launch of an additional nine flights in fiscal year 1985, including the first flight of the fourth orbiter, Atlantis. In addition, during fiscal year 1985, KSC will be responsible for processing Discovery at KSC for preparation for the first flight at the Vandenburg launch site in early 1986. A consolidated operations contract covering most of the flight

operation functions performed at JSC is in preparation; award date is anticipated to be early 1985.

Committee Comment

The Committee expects that as the Shuttle flight rate continues to increase during fiscal year 1985, NASA should be able to achieve greater economies in its Shuttle operations while adequately supporting the Shuttle flight schedule for fiscal year 1986. Accordingly, the Committee expects NASA to accommodate the $25 million reduction in funding below the administration's budget request without any degradation in Shuttle safety and reliability.

The Committee retains a strong interest in reducing the operating costs of the Space Transportation System, and notes with interest NASA's ongoing study of possible savings resulting from a second source for the solid rocket boosters.

This question is of great importance to the Committee. The solid rocket boosters have a significant effect on the overall price of the Shuttle and play a critical role in the STS.

The Committee anticipates that NASA's study will examine the process and financing requiring to develop a second solid rocket booster source. It is expected that the study will examine whether competition in the solid rocket booster program over both the short-term and long-term will enhance the economic viability of the Shuttle.

NASA's decision is expected to conform to the goal of ensuring routine low-cost access to space. The Committee further expects the administrator to pursue the course which provides the most cost-effective means of supplying solid rocket boosters to the space program, and best meets the present and future needs of the Space Transportation System.

Space and Ground Network, Communications, and Data Systems—$745,300,000

The Committee authorizes $745,300,000 for Space and Ground Network, Communications, and Data Systems, $63 million below the administration's budget request. This recommendation is achieved by the deferral of the scheduled $107 million principal payment to the Federal Financing Bank, by the additional authorization of $48 million to the TDRSS program, and by implementing a general reduction of $4 million.

The purpose of this program is to provide vital tracking, command, telemetry, and data acquisition support to meet the requirements of all NASA flight projects. In addition to NASA flight projects, support is provided on a reimbursable basis for projects of the DOD, other government agencies, commercial firms, and other countries and international organizations engaged in space research.

Support is provided for sounding rockets and balloons, research aircraft, and Earth orbital and planetary missions. The program also includes the support of the Space Shuttle and Spacelab flights program. The various types of support provided include: (1) tracking to determine the position and trajectory of vehicles in space; (2) acquisition of scientific and space applications data from on-board

experiments and sensors; (3) acquisition of engineering data on the performance of spacecraft and launch vehicle systems; (4) transmission of commands from ground stations to spacecraft; (5) communication with astronauts; (6) transfer of information between the various ground facilities and control centers; (7) processing of data acquired from the launch vehicles and spacecraft; and (8) reception of television transmission from space vehicles. Such support is essential for achieving the scientific objectives of all flight missions, for executing the critical decisions which must be made to assure the success of these flight missions, and, in the case of Shuttle missions, to insure safety of the crew.

Tracking and acquisition of data for the spaceflight projects is accomplished through the use of a worldwide network of NASA ground stations, and by the first of a system of three tracking and data relay satellites in geosynchronous orbit working with a simple highly specialized ground station. Ground facilities are interconnected by ground communications lines, undersea cables, and communications satellite circuits which are leased from communications carriers, both domestic and foreign. This interconnection provides the communications capability needed between spacecraft and the control centers from which the flights are directed.

To meet the support requirements levied by the wide variety and large number of flight projects, NASA has established three basic support capabilities to meet the needs of all classes of NASA flight missions. These are the Spaceflight Tracking and Data Network (STDN), which supports Earth orbital missions; the Deep Space Network (DSN), which supports planetary and interplanetary flight missions; and the TDRSS, which will provide all low Earth orbital mission support when it becomes full operational. The STDN will continue to provide Earth orbital support until three TDRSS spacecraft are launched, properly positioned, and have completed pre-operational testing to ensure reliable mission operations support.

When the TDRSS is fully operational, a phaseout of selected STDN ground stations will be initiated. This is presently planned for the first half of 1986. Certain facilities of the STDN will be retained to provide support to geosynchronous and highly elliptical missions which cannot be supported via the TDRSS or to provide launch and Shuttle landing support. These remaining facilities, except for the launch and Shuttle landing support facilities, are being consolidated with the DSN stations under the management of the Jet Propulsion Laboratory. The consolidation, when completed, will provide a single network to support geosynchronous, highly elliptical, and planetary missions. The consolidated network will also support those spacecraft, now in low-Earth orbit, which are not compatible with TDRSS.

The Space Network consists of the TDRSS and a number of NASA ground elements to provide the necessary tracking, telemetry, command, and communication services to low Earth-orbital spacecraft. The TDRSS itself will consist of a three-satellite system in geosynchronous orbit and a single ground terminal located at White Sandss, New Mexico. The satellites communicate with the user spacecraft in space and relay information to and from the ground terminal. From the ground terminal, satellite and ground

communication links interconnect the NASA elements of the network and any remotely located user facilities.

The administration's fiscal year 1986 request includes funding for: repayment, including a $30 million prepayment, of the loans extended by the Federal Financing Bank for TDRSS development; payments to the TDRSS contractor for continuing TDRSS production, TDRSS services, and for maintenance and operation of the White Sands Complex; manpower and services necessary to operate and maintain the other NASA elements of the network; and systems engineering, engineering analyses, and other support services to the network elements such as mission planning, logistics, and documentation.

The TDRS–1 was launched in April, 1983, and the Inertial Upper Stage (IUS) booster failed to deliver the TDRS spacecraft into the correct orbit. In later June, 1983, the mission was recovered through a complex sequence of maneuvers and the spacecraft was placed into its nominal orbit. Since that time, the spacecraft has supported subsequent Shuttle missions, including Spacelab–1 and Landsat 5, while continuing the test and checkout of the TDRSS spacecraft and ground terminal. The TDRS–1 spacecraft experienced partial failure of the Ku-Band forward link that provides communication from TDRSS to the user spacecraft. The cause of this failure has been isolated and a modification has been implemented on subsequent spacecraft.

The launches of TDRS–2 and –3 were originally delayed while modifications were made to the IUS to rectify the causes of the anomaly experienced during the first launch. The redesigned and retested IUS performed successfully when it deployed a DOD satellite into geosynchronous orbit as part of mission 51–C, which occurred January 24–27, 1985. TDRS–2 was to have been deployed by the IUS on mission 51–E, scheduled for a March, 1985 launch. One week before the scheduled launch, however, a defective cell in a 24-cell flight battery of TDRS–2 was discovered. At this same time, a timing problem was discovered in TDRS–1 during testing. It was also determined that the problem is generic to all TDRS spacecraft. TDRS–2 was removed from the orbiter Challenger and mission 51–E was cancelled. The timing problem is being analyzed and modifications will be made to the TDRS spacecraft that have not been deployed.

The launches of TDRS–2 and TDRS–3 will complete the operational constellation of two TDRS's with TDRS–1 being used as an on-orbit spare. The first ground spare spacecraft has completed environmental testing and is now in storage. Current planning provides for launch of the initial four spacecraft using the IUS and the launch of subsequent spacecraft using a competitively procured upper stage.

As of January 1, 1985, the Ground Network included the STDN, consisting of 11 geographically dispersed ground stations which support Earth orbital mission; the DSN, consisting of three stations approximately 120 degrees apart in longitude for continuous mission viewing, which support planetary and interplanetary flight missions; and support for Aeronautics Balloon and Sounding Rocket programs at the Wallops Flight Facility, the Dryden Flight Research Facility, the Moffett Field Flight Complex, and White

Sands Missile Range, as well as instrumentation support at the National Balloon Facility at Palestine, TX.

Funds requested for the Communications and Data Systems program provide for the implementation and operation of facilities and systems which are required for data transmission, mission control and data processing support.

Information is crucial to determining the condition of the spacecraft and payload control. Data received from the various spacecraft must be processed into a usable form before transfer to control centers and experimenters. Such support is mandatory for achieving mission objectives. Missions supported included Shuttle, NASA scientific and applications missions, and international cooperative efforts.

Committee Comments

The Committee's fiscal year 1986 recommendation of $745,300,000 for Space Tracking and Data Acquisition includes an additional $48 million above the administration's budget request for the TDRSS to accommodate the costs associated with the recent TDRSS problems as described above.

It is uncertain when NASA will be able to launch TDRS-2 and -3, but until TDRS-2 and -3 are deployed and operational, NASA must continue to operate its full complement of STDN ground stations. Meanwhile, NASA will continue to incur costs associated with keeping open these STDN ground stations. Within the fiscal year 1986 budget request NASA can support these ground stations only through January 1986. Therefore, the Committee's additional authorization of $48 million is for 8 months of TDRSS activities beyond January 1986. Of this $48 million, $28 million is for keeping open the STDN ground stations; the balance of this additional authorization, $20 million, is for extension of checkout and testing of the satellites with the ground stations; production and preparation activities of subsequent spacecraft; and delayed handling and launch related costs.

The Committee expects to be kept informed about any additional resource requirements and technical deficiencies associated with TDRSS as well as the resolution of the current problem and launch delays.

The Committee authorization for Space Tracking and Data Acquisition also reflects a deferral of NASA's fiscal year 1986 principal payment of $107 million to the Federal Financing Bank. This payment is currently scheduled pursuant to NASA's loan agreement with the Federal Financing Bank to finance TDRSS development. Payment of the $107 million in principal will be deferred until 1993, when the current contract terminates, and 1994. However, NASA is expected to pay the Federal Financing Bank in fiscal year 1986 the scheduled *interest* payment of $157 million.

Both the Congressional Budget Office and the Senate Budget Committee have concluded that this $107 million deferral will not result in any additional outlays in fiscal year 1986 nor affect in any way the Committee's direct spending authority.

Finally, the Committee assumes a general reduction of $4 million for Space Tracking and Data Acquisition as part of its overall budget deficit reduction program.

CONSTRUCTION OF FACILITIES—$139,300,000

The Committee authorizes $139,300,000 for Construction of Facilities, $10 million below the administration's request. This authorization is for the purposes described below, and the $10 million reduction is to be applied to these projects, at the discretion of NASA:

(1) Space transportation facilities at various locations as follows:

(A) Construction of orbiter modification and refurbishment facility, John F. Kennedy Space Center, $14 million;

(B) Construction of thermal protection system facility, John F. Kennedy Space Center, $3,600,000;

(C) Modifications for advanced technology engine test stand S–1C, George C. Marshall Space Flight Center, $6,500,000;

(D) Modification for enhanced life support systems testing, Lyndon B. Johnson Space Center, $1,100,000;

(E) Modifications to Pad A payload change-out room, John F. Kennedy Space Center, $2,200,000;

(F) Modifications to space shuttle main engine support systems, National Space Technology Laboratories, $2,500,000;

(2) Space Shuttle payload facilities at various locations as follows:

(A) Construction of payload control rooms, John F. Kennedy Space Center, $1,200,000;

(B) Construction of spacecraft systems development and integration facility, Goddard Space Flight Center, $8 million;

(3) Construction of additions to research projects laboratory, Goddard Space Flight Center, $3,800,000;

(4) Construction of microdevices laboratory, Jet Propulsion Laboratory, $8,900,000;

(5) Construction of numberical aerodynamic simulation facility, Ames Research Center, $8,200,000;

(6) Modifications of the 16-foot transonic tunnel for improved productivity and research capability, Langley Research Center, $4,900,000;

(7) Modification of 64-meter antenna, DSS–14, Goldstone, California, $8,500,000;

(8) Modifications of 64-meter antenna, DSS–43, Canberra, Australia, $8,900,000;

(9) Repair of facilities at various locations, not in excess of $750,000 per project, $22 million;

(10) Rehabilitation and modification of facilities at various locations, not in excess of $750,000 per project, $27 million;

(11) Minor construction of new facilities and additions to existing facilities at various locations, not in excess of $500,000 per project, $6 million; and

(12) Facility planning and design not otherwise provided for, $12 million.

The Construction of Facilities appropriaton provides for contractual services for repair, rehabilitation, and modification of existing facilities; the construction of new facilities; the acquisition of relat-

ed facility equipment; and the design of facilities projects and advance planning related to future facilities needs.

The funds requested for 1986 provide for: the continuation of prior year's endeavors in meeting the facilities requirements for the Space Shuttle; Space Shuttle Payload support operations; modification of aeronautical research and development facilities; repair, rehabilitation, and modification of other facilities to maintain, upgrade, and improve the usefulness of the NASA physical plant; minor construction of new facilities; and facility planning and design activities.

The projects and amounts in the budget estimate reflect Space Shuttle and Space Shuttle Payload requirements that are time sensitive to meet specific milestones. Other program requirements for 1986 include the construction of additions to the research project laboratory, and construction of a spacecraft systems development and integration facility at Goddard Spacecraft Center; construction of a microdevices laboratory at the Jet Propulsion Laboratory; ongoing construction on the numerical aerodynamic simulatoin facility at the Ames Research Center; modifications to the 16-foot transonic tunnel for improved productivity and research capability at the Langley Research Center; and modification of 64-meter antennas, DDS–14, Goldstone, CA, and DSS–43, Canberra, Australia.

The fiscal year 1986 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and ensures safe, economical, and efficient use of the NASA physical plant. This request continues the necessary rehabilitation and modification program as in prior years and continues a repair program. The purpose of the repair program is to restore facilities to a condition substantially equivalent to their originally designed capability. The minor construction program continues to provide a means to accomplish smaller facility projects which accommodate changes in technical and institutional requirements.

Committee Comments

The Committee's reduction in funding of $10 million below the administration's budget request is made without prejudice.

Research and Program Management—$1,370,000,000

The Committee authorizes $1,370 million for Research and Program Management, $25 million above the administration's request of $1,345 million. This increase is the net result of an increase of $42 million for civil service pay and a general reduction of $17 million.

The Research and Program Management appropriation funds the performance and management of research, technology, and test activities at NASA installations, and the planning, management, and support of contractor research and development tasks necessary to meet the Nation's objectives in aeronautical and space research. Objectives of the efforts funded by the Research and Program Management appropriation are: (1) to provide the technical and management capability of the civil service staff needed to conduct the full range of programs for which NASA is responsible; (2) to provide base maintenance of facilities and manage their use in support

of research and development programs; and (3) to provide effective and efficient technical and administrative support for the research and development programs.

The 21,800 permanent and temporary civil service personnel at eight major installations and Headquarters are funded by the Research and Program Management appropriation. This civil service work force is NASA's most important resource and is vital to future space and aeronautics research activities. Seventy percent of the Research and Program Management appropriation is needed to provide for salaries and related costs of this civil service work force. About two percent is for travel, which is vital to management of the Agency's in-house and contracted programs. The remaining amount of the Research and Program Management appropriation provides for the research, test and operational facility support, and for related goods and services necessary to operate the NASA installations and to accomplish NASA's approved missions.

Committee Comment

The Committee recognizes that the lifeblood of NASA is its personnel and that in order to maintain the level of continuity and efficiencies that are critical to each of the agency's programs, NASA's civil servant pay should not create unnecessary disruptions in the civil service work force of the Agency. Accordingly, the Committee rejects the five percent pay reduction for NASA's civil servants that is assumed in the administration's budget request and authorizes an additional $42 million for Research and Program Management to restore this reduction.

The Committee also recommends a $17 million general reduction in Research and Program Management which can be achieved by delaying or eliminating less critical activities. Furthermore, the Committee expects that the general reduction will not affect civil service pay.

Shuttle Pricing Policy

COMMITTEE COMMENTS

The Committee has chosen, at this point in the authorization process, to await the administration's decision relative to establishing a Shuttle pricing policy for commercial and foreign customers during fiscal years 1989–91. The Committee has held hearings on this issue and notes that the administration's efforts in addressing the Shuttle pricing policy have moved from the Cabinet Council on Commerce and Trade to the Senior Interagency Group on Space, which will present the final recommendation(s) to the President. Furthermore, this issue is being addressed indirectly by the office of the U.S. Trade Representative as it studies a related trade matter.

In the interests of allowing the Federal interagency process to analyze fully the Shuttle pricing policy with as few restrictions as possible, the Committee will wait for the administration's decision on a Shuttle pricing policy for fiscal years 1989–91. Pursuant to Section 8 of this bill, the Committee intends to assess this policy decision and its potential effect on the domestic expendable launch

vehicle industry, the commercial development of space, and the overall goals and requirements of the Nation's space program. If the Committee believes that the administration's policy decision is not in the best interests of the Nation and the civil space program, the Committee will then propose legislation to establish a Shuttle pricing policy that more completely satisfies our national goals and objectives in space as well as those of the Nation as a whole.

ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, June 14, 1985.

Hon. JOHN C. DANFORTH,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Dirksen Senate Office Building, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the attached cost estimate for S. 1278, the National Aeronautics and Space Administration Act, 1985.

If you wish further details on this estimate, we will be pleased to provide them.

With best wishes,
Sincerely,

RUDOLPH G. PENNER, *Director.*

CONGRESSIONAL BUDGET OFFICE—COST ESTIMATE

1. Bill number: S. 1278.

2. Bill title: The National Aeronautics and Space Administration Act, 1986.

3. Bill status: As ordered reported by the Senate Committee on Commerce, Science, and Transportation on June 13, 1985.

4. Bill purpose: This bill authorizes the appropriation of $7,652 million for the National Aeronautics and Space Administration (NASA) and $586,000 for the Office of Commercial Space Transportation within the Department of Transportation for fiscal year 1986.

The authorization includes $2,642 million for the production and operation of the space shuttle, $200 million for the development of a space station, $2,556 for other research and development activities, and $745 million for the space tracking system. The bill also includes $139 million for construction of facilities and $1,370 million for research and program management. Also, NASA's scheduled $107 million repayment to the Federal Financing Bank is deferred. The total amount authorized $234 million below the President's fiscal year 1986 budget request and $142 million above the fiscal year 1985 appropriation for NASA.

5. Estimated cost to the Federal Government:

[In millions of dollars]

	Fiscal years—				
	1986	1987	1988	1989	1990
Authorization level:					
Function 250 civilian space	7,028.8				
Function 400 aeronautics	623.2				
Commercialization	.6				
Total	7,652.6				
Estimated outlays:					
Function 250 civilian space	5,201,0	1,580.2	232.3	15.3	
Function 400 Aeronautics	397.9	178.2	43.5	2.2	1.4
Commercialization	.5	.1			
Total	5.599.4	1,758.5	275.8	17.5	1.4

The costs of this bill fall within budget function 250.

Basis of estimate: The authorization levels are the amounts specified in the bill. The outlay estimates assume that all funds authorized will be appropriated prior to the beginning of fiscal year 1986 and that spending will reflect historical patterns.

6. Estimated cost to State and local governments: None.

7. Estimate comparison: None.

8. Previous CBO estimate: On March 28, 1985, CBO prepared a cost estimate for H.R. 1714, a bill to authorize appropriations for the National Aeronautics and Space Administration, as ordered reported by the House Committee on Science and Technology. The appropriations authorized in S. 1278 are about $234 million less than are contained in the House bill, and estimated outlays are correspondingly less. The House bill did not include language authorizing the deferral of principal repayments to the Federal Financing Bank, and includes $107 million for such repayments.

9. Estimate prepared by: Paul M. DiNardo.

10. Estimate approved by: James L. Blum, Assistant Director for Budget Analysis.

Regulatory Impact Statement

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation:

This bill authorizes the appropriation of funds for the conduct of space and aeronautical research and development activities to carry out the policy and purpose of the National Aeronautics and Space Act of 1958. These activities are conducted in NASA laboratories by NASA personnel and through contracts with industry, universities, and research institutions for research and develop-

ment and for supporting scientific and technical services. The Committee has concluded the nature of these activities is such that there is no regulatory effect on individuals and businesses and no effect on individual privacy.

Section 10 of this bill extends the life of the National Commission on Space, established last year pursuant to Public Law 98-361, from twelve months to eighteen months. This will give the Commission a full year to complete its assessment of the civilian space program, because the Commission was unable to initiate its formal proceedings and activities for the first six months of its existence, through no fault of its own. The Committee does expect an increase in paperwork as the Commission performs its studies and analyses. This increase will not be burdensome, however.

Changes in Existing Law

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

The National Aeronautics and Space Administration Authorization Act, 1985

Section 204 of that Act

FUNCTIONS OF THE COMMISSION

Sec. 204. (a)-(b) * * *

(c) Within [twelve] *18* months after the date of the establishment of the Commission, the Commission shall submit to the President and to the Committee on Commerce, Science and Transportation of the Senate and the Committee on Science and Technology of the House of Representatives, a long range plan for United States civilian space activity incorporating the results of the studies conducted under this section, together with recommendations for such legislation as the Commission determines to be appropriate.

The Commercial Space Launch Act

Section 24 of that Act

AUTHORIZED APPROPRIATIONS

Sec. 24. There are authorized to be appropriated to the Secretary $4,000,000 for fiscal year 1985. *There are authorized to be appropriated to the Secretary to carry out this Act $586,000 for fiscal year 1986.*

ADDITIONAL VIEWS OF MR. RIEGLE

There are a number of issues in this legislation which are very important to me. Since being named ranking member of the Subcommittee on Science, Technology and Space, I have had an opportunity to learn a great deal about our civilian space program, and its critical importance to the technological base in our country. The bill that has been approved is the product of many hours of work by many different people. It is a tremendous compromise given the budgetary situation, which makes it difficult to fund all of the worthwhile efforts within NASA. The fact that we have developed a bill that has been unanimously reported by this Committee, and one whose funding level has been endorsed by the chairman and ranking member of the appropriations subcommittee is testimony to the consensus which exists in support of our civilian space program.

The legislation provides for full funding in the research and analysis budget. This is the principal source of funding for university research, and is truly the basis for our future space program, and for areas that we can't even conceive of today. This is a program that is extremely important to the University of Michigan among others, and the funding level contained in this bill ensures that we will maintain the scientific base, both in terms of data and manpower, to continue our leadership in space.

I am pleased that the legislation calls for $200 million for the space station program. While this is not the level of funding originally requested, it will be sufficient to keep the program on track. I see the space station as an inevitable step in the worldwide effort to fully realize the commercial benefits of space. Presently, the United States is the only western nation with the technological capability to put a station in orbit by the end of the century; but only if we make a commitment now to achieve that goal, we stand a good chance of losing this opportunity to other nations, such as Japan or the European Space Agency.

One area of extreme importance to America's competitive posture is the aeronautics budget, and I am most pleased that we have been able to accommodate almost the entire request. At this time, we are still the world's leader in aeronautical research and production. If you go anywhere in the world, the majority of aircraft flying are of U.S. origin. In large part, this position has been made possible through the partnership between government and industry in the development of new airframes, engines, and avionics. While our overall balance of trade has been bleeding this Nation, the trade in aircraft, and associated items remains positive.

This situation can change at any time, and we have already seen an increase in efforts by European companies to market the Airbus for U.S. carriers, as well as attempts to market aircraft from other nations. OMB proposed a total elimination of NASA support for

aeronautical research, on the theory that private industry would fund the program. In my view, this is another example of a short-sighted policy suggestion by OMB and one which would put at risk our entire aeronautics industry. There is no doubt in my mind that if we eliminate funding in this area, we will see Europe, Japan, and other countries moving to fill the market around the world, with the permanent loss of thousands of jobs and an important technological base in the United States. I feel that we have made the appropriate decision to continue funding for this program and know that it will help to maintain the health of this industry.

Finally, Mr. Chairman, a related comment about shuttle pricing policies. As you know, the President is due to issue his recommendation for the next phase of shuttle pricing, and therefore our bill is silent on that issue. This decision, which we will all become involved in, will determine the viability and success of our entire commercial program for the next decade. A policy which prices the shuttle too high will doom that program, and all related programs to a residual status in the world marketplace. I, for one, do not believe that our competitors will raise their launch costs anywhere near that of some of the proposed shuttle prices. If the decision places shuttle prices in the high end of the ranges proposed, we are handing millions of dollars to overseas competitors. In my view, the shuttle has proven its value many times over, and it is still a young system. I do not want to take any actions now which will in any way jeopardize its future success, the success of our commercialization activities, and in a very real sense our economic future in space.

There are tremendous opportunities, both scientific and commercial, to be realized in space. That program has been a highly successful example of Government-industry cooperation, and I hope that we will continue that effort. This bill is consistent with that goal, and I am pleased that we have achieved consensus in support of its objectives.

DON RIEGLE.

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Calendar No. 210

99TH CONGRESS
1st Session

SENATE

REPORT
99-93

IN-FLIGHT MEDICAL EMERGENCIES ACT

JUNE 27 (legislative day JUNE 26), 1985.—Ordered to be printed

Mr. DANFORTH, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

[To accompany S. 63]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 63) to encourage the rendering of in-flight emergency care aboard aircraft by requiring the placement of emergency first aid medical supplies and equipment aboard aircraft and by relieving appropriate persons of liability for the provison and use of such equipment and supplies, having considered the same, reports favorably thereon without amendment and recommends that the bill do pass.

PURPOSE OF BILL

S. 63, as reported, would direct the Federal Aviation Administration (FAA) to devise a new medical kit to be carried aboard commercial aircraft for the treatment of in-flight medical emergencies. It would also relieve appropriate persons from liability related to the use of the kits.

BACKGROUND AND NEEDS

Current FAA regulations require certain passenger-carrying aircraft to carry a first aid kit (see, e.g., 14 CFR 125.207). Such kits are required to contain bandages, splints, burn ointments, and other first aid type items. The purpose stated in the regulations for such kits is to treat "injuries likely to occur in flight or in a minor accident."

Certain groups and individuals have argued that the current medical kits required in aircraft are inadequate and outdated. They argue further that the kits should contain equipment and

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supplies to deal with medical emergencies directly caused by in-flight accidents as well as those that are not flight induced.

The FAA has a rulemaking in progress to modify the contents of the medical kits that airliners must carry. The effect of S. 63 would be to require completion of this rulemaking within 180 days of enactment of the act.

Legislative History

S. 63 was introduced by Senator Goldwater on January 3, 1985. The Committee did not hold hearings on S. 63. However, similar legislation, introduced in the 97th Congress, was the subject of hearings on May 20, 1982.

The Committee ordered S. 63 to be reported favorably, without objection.

Summary of Major Provisions

As reported, S. 63 would:

1. direct the FAA to issue final rules requiring aircraft carrying passengers for compensation or hire to "carry sufficient first aid medical supplies and equipment for the rendering of emergency care aboard the aircraft in response to in-flight medical emergencies;" and
2. relieve licensed medical personnel, the air crew and the airlines from liability arising from the carriage and use of the kits, so long as they did not act recklessly or with gross negligence.

Estimated Costs

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. Congress,
Congressional Budget Office,
Washington, DC, June 18, 1985.

Hon. John C. Danforth,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, DC.

Dear Mr. Chairman: The Congressional Budget Office has reviewed S. 63, the In-Flight Medical Emergencies Act, as ordered reported by the Senate Committee on Commerce, Science and Transportation, May 16, 1985. We estimate that enactment of this bill would result in no significant cost to the federal government, or to state or local governments.

This bill requires the Federal Aviation Administration to issue regulations requiring aircraft carrying passengers for compensation or hire to carry first-aid medical supplies and equipment, and, in the event of an emergency, that these be made available to licensed medical personnel and qualified airline employees. The bill further provides that any qualified person who, in good faith, renders assistance aboard the aircraft is not liable for any civil damage.

If you wish further details on this estimate, we will be pleased to provide them.

With best wishes,

Sincerely,

RUDOLPH G. PENNER.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of Senate, the Committee provides the following evaluation of the regulatory impact of the legislation:

The bill would change the content of the kit required to be carried aboard commercial aircraft. To the extent that the new kit will be more expensive than that currently required, the existing regulation will become more burdensome as a result of S. 63.

Current FAA regulations require a medical kit aboard a commercial aircraft only if it has more than 19 seats. S. 63, as reported, would extend that requirement to all aircraft carrying passengers for compensation or hire. Thus, S. 63 will increase the regulatory burden of commercial operators of aircraft with fewer than 20 seats.

There should be no effect on the personal privacy of individuals due to enactment of the legislation. No significant new paperwork burdens would be placed on any person if S. 63 were enacted into law.

SECTION-BY-SECTION ANALYSIS

SECTION 1.—SHORT TITLE

The first section provides that this act may be cited as the "In-Flight Medical Emergencies Act".

SECTION 2.—DEFINITIONS

This section contains definitions of terms used in the bill. The only definition requiring any explanation is that of "emergency care." The last clause of that definition reads: "but does not include the operation of an aircraft." The purpose of this clause is related to the relief of liability provided by the bill. It is designed to make sure that the air crew is not relieved of liability for the negligent operation of the aircraft in response to or in connection with an inflight medical emergency. The relief of liability extends only to the actual rendering of medical care to the ill or injured passenger.

SECTION 3.—REQUIREMENT TO CARRY MEDICAL KIT

This section requires the FAA to issue a final rule requiring updated medical kits within 180 days of the date of enactment of the act. Every aircraft carrying passengers for compensation or hire shall be required to carry the kits. The section further requires the regulations to make the kits available to the air crew and licensed medical personnel that the Administrator has determined can properly use them.

Although the Committee supports carriage of an enhanced medical kit aboard commercial aircraft, it is clear that these kits should

not contain dangerous surgical instruments, such as scalpels or other incisive devices, or controlled substance, as defined in the Comprehensive Drug Abuse Prevention and Control Act of 1970 (21 U.S.C. 801 et seq.). These items, even in the most sophisticated of hospital emergency facilities, must be handled with extreme caution and only in conjunction with the elaborate diagnostic equipment and expertise available at such facilities. They are not suitable for carriage in an onboard medical kit.

The Committee recognizes that the above requirements apply to a broad range of aircraft. It is the intent of the Committee that the FAA regulations promulgated pursuant to this bill reflect the differences in aircraft size and crew complement. It is anticipated, for example, that a single-engine, four-seat aircraft used in an air taxi operation will be required to carry a less elaborate kit than a large air transport aircraft. The appropriate dividing lines and kit content is left to the FAA's discretion.

SECTION 4.—RELIEF OF LIABILITY

This section provides that any licensed medical personnel or any air carrier employee who uses the medical kits in good faith shall not be liable for civil damages as a result of such use. This relief of liability does not apply, however, if the actions were done recklessly or with gross negligence.

SECTION 5.—FURTHER RELIEF OF LIABILITY

This section:

1. extends the relief of liability of section 4 to the employees of the owner or operator of the aircraft, the entire air crew of the aircraft, and the owner or operator itself; and
2. relieves the persons in clause 1 above from civil liability arising from the carriage, and provision to appropriate people, of medical supplies in accordance with FAA regulations.

SECTION 6.—JURISDICTION

This section provides that the relief of liability accorded by sections 4 and 5 shall apply in actions brought in both Federal and State courts.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, the Committee states that the bill as reported would make no change to existing law.

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